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PROCEEDINGS

OF THE

AMERICAN SOCIETY

OF

CIVIL ENGINEERS

VOL. XLII—No. 2

February, 1916

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PROCEEDINGS

OF THE

AMERICAN SOCIETY

OF

CIVIL ENGINEERS

(INSTITUTED 1852)

VOL. XLII—No. 2

FEBRUARY, 1916

Edited by the Secretary, under the direction of the Committee on Publications.

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NEW YORK 1916

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TO CODIFY PRESENT PRACTICE ON THE BEARING VALUE OF SOILS FOR FOUNDATIONS, ETC.: Robert A. Cummings, Edwin Duryea, Jr., E. G. Haines, Allen Hazen, James C. Meem, Walter J. Douglas.

ON A NATIONAL WATER LAW: F. H. Newell, George G. Anderson, Charles W. Comstock, Clemens Herschel, W. C. Hoad, Robert E. Horton, John H. Lewis, Charles D. Marx, Gardner S. Williams.

ON FLOODS AND FLOOD PREVENTION: C. McD. Townsend, John A. Bensel, T. G. Dabney, C. E. Grunsky, Morris Knowles, J. B. Lippincott, Daniel W. Mead, John A. Ockerson, Arthur T. Safford, Charles Saville, F. L. Sellew.

TO REPORT ON STRESSES IN RAILROAD TRACK: A. N. Talbot, A. S. Baldwin, J. B. Berry, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing, Robert W. Hunt, George W. Kittredge, Paul M. LaBach, C. G. E. Larsson, William McNab, G. J. Ray, Albert F. Reichmann, F. E. Turneaure, J. E. Willoughby.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

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AMERICAN SOCIETY OF CIVIL ENGINEERS

INSTITUTED 1852

PROCEEDINGS

This Society is not responsible for any statement made or opinion expressed in its publications.

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MINUTES OF MEETINGS

OF THE SOCIETY

SIXTY-THIRD ANNUAL MEETING*

January 19th, 1916.—The meeting was called to order at 10 A. M.; President Charles D. Marx in the chair; Charles Warren Hunt, Secretary; and present, also, about 500 members.

The Annual Report of the Board of Direction, and the Annual Reports of the Secretary and of the Treasurer,† for the year ending December 31st, 1915, were presented and accepted.

* A full report of the Sixty-third Annual Meeting is printed on pages 80 to 117 of this number of *Proceedings*.

† For these reports, see pages 13 to 23 of *Proceedings* for January, 1916 (Vol. XLII).

The Secretary read the report of the Committee appointed by the Board of Direction to recommend the award of prizes,* and announced that the Medals and Prizes for the year ending July, 1915, had been awarded by the Board of Direction in conformity with that report, as follows:

THE NORMAN MEDAL to Paper No. 1308, entitled "Storage to be Provided in Impounding Reservoirs for Municipal Water Supply", by Allen Hazen, M. Am. Soc. C. E.

THE J. JAMES R. CROES MEDAL to Paper No. 1304, entitled "Measurement of the Flow of Streams by Approved Forms of Weirs with New Formulas and Diagrams", by Richard R. Lyman, Assoc. M. Am. Soc. C. E.

THE THOMAS FITCH ROWLAND PRIZE to Paper No. 1292, entitled "Modern Pier Construction in New York Harbor", by Charles W. Staniford, M. Am. Soc. C. E.

THE JAMES LAURIE PRIZE to Paper No. 1291, entitled "Coal Piers on the Atlantic Seaboard", by J. E. Greiner, M. Am. Soc. C. E.

THE COLLINGWOOD PRIZE FOR JUNIORS to Paper No. 1281, entitled "Colorado River Siphon", by George Schobinger, Jun. Am. Soc. C. E. (now Assoc. M. Am. Soc. C. E.).

The Secretary presented the report of the Tellers appointed by the Board of Direction to canvass the suggestions as to members of the Nominating Committee, and the following were appointed to serve two years:

E. J. FORT	*Representing*	*District*	*No.*	*1.*
S. E. TINKHAM	"	"	"	*2.*
F. W. CAPPELEN	"	"	"	*3.*
H. H. QUIMBY	"	"	"	*4.*
E. N. LAYFIELD	"	"	"	*5.*
W. B. GREGORY	"	"	"	*6.*
J. B. C. LOCKWOOD				

W. W. Crosby, M. Am. Soc. C. E., Chairman of the Special Commitee on Materials for Road Construction and Standards for Their Test and Use, presented a Progress Report of that Committee.†

On motion, duly seconded, the matter of enlarging both the membership and the scope of the Special Committee on Road Materials was referred to the Board of Direction.

Gardner S. Williams, M. Am. Soc. C. E., at the request of F. H. Newell, M. Am. Soc. C. E., Chairman of the Special Committee on A National Water Law, presented a Progress Report of that Committee.‡

The report was accepted.

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* See page 80.

† Printed on pages 2721 to 2746 of Papers and Discussions in the *Proceedings* for December, 1915.

‡ Printed on pages 2747 to 2751 of Papers and Discussions in the *Proceedings* for December, 1915.

The Progress Reports of the Special Committee on Steel Columns and Struts* and of the Special Committee on Floods and Flood Prevention† were accepted.

On motion, duly seconded, the Special Committee on Floods and Flood Prevention was continued for the purpose of joining with the Special Committee on A National Water Law.

The Secretary reported that he had received a discussion on the report of the Special Committee on Floods and Flood Prevention; and was authorized to print it in *Proceedings*.

J. R. Worcester, M. Am. Soc. C. E., Chairman of the Special Committee on Concrete and Reinforced Concrete, reported that the Committee had no report to present, but was preparing its final report, and hoped to present it prior to July 1st, 1916.

This was accepted as a Progress Report.

Desmond FitzGerald, Past-President, Am. Soc. C. E., Chairman of the Special Committee on Engineering Education, reported progress, and Professor C. R. Mann addressed the meeting on that subject.

The Committee was continued.

Leonard Metcalf, M. Am. Soc. C. E., Secretary of the Special Committee on Valuation of Public Utilities, on behalf of Frederic P. Stearns, Past-President, Am. Soc. C. E., Chairman of that Committee, submitted a Progress Report.

The report was accepted.

The report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers was called for, and the Secretary stated that the Committee was preparing a complete report and expected to submit it at the Annual Convention.

This was accepted as a Progress Report.

Robert A. Cummings, M. Am. Soc. C. E., Chairman of the Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations, presented a Progress Report.‡

The report was accepted.

A. N. Talbot, M. Am. Soc. C. E., Chairman of the Special Committee to Report on Stresses in Railroad Track, presented a Progress Report.§

The report was accepted.

R. S. Buck, M. Am. Soc. C. E., presented a resolution to the effect that it is the sense of the meeting that the Army and Navy establishments of the Government should be enlarged and that the industrial and transportation resources of the country should be mobilized.

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* Printed on pages 2753 to 2769 of Papers and Discussions in the *Proceedings* for December, 1915.

† Printed on pages 2771 to 2787 of Papers and Discussions in the *Proceedings* for December, 1915.

‡ This report will be printed in the *Proceedings* for March, 1916.

§ See page 103.

On motion, duly seconded, the meeting declared its sympathy and general approval of the principles set forth in the resolution as offered by Mr. Buck, and that the Board of Direction be instructed to consider to-day and prepare a suitable expression of those ideas, to be transmitted to the American Security Congress to-morrow, through the Committee of this Society on National Preparedness.

The Secretary announced the election of the following candidates on December 6th, 1915:

As Members

Samuel Eben Barney, New Haven, Conn.
George Washington Bishop, Newtonville, Mass.
Charles Clefford Jacobs, Amboy, Ill.
Fred Atwood Jones, Dallas, Tex.
Paul Nash, Stamford, Conn.
Petrus Wahlman, New York City

As Associate Members

Lewis Penn Bailey, Legaspi, Philippine Islands
Ernest Wood Baldwin, Balboa, Canal Zone, Panama
Herbert Bartholomew, Pedro Miguel, Canal Zone, Panama
Roswell Spencer Baylis, Huntington, N. Y.
John Wilson Bell, Carlsbad, N. Mex.
Clarence Earl Blee, San Francisco, Cal.
Charles Norton Boult, Westport, New Zealand
Evlane Kemper Carter, Liberty, Mo.
William Clark Cattell, Wenonah, N. J.
John William Cerny, Denver, Colo.
Elga Ross Chamblin, Dallas, Tex.
Norman Butler Conway, Yuma, Ariz.
Arthur Daniels, Milwaukee, Wis.
William Clarence Davidson, Waco, Tex.
Thomas Henry Dennis, Colusa, Cal.
George Garrett Edwards, Ennis, Tex.
Frederic Elwin Everett, Concord, N. H.
Frederic Morris Faude, San Diego, Cal.
Harry Franklin Flynn, Seattle, Wash.
William Norman Hall, Brownsville, Tex.
Fletcher Ames Hatch, Atlantic, Mass.
Beauford Emmett Hayden, Newell, S. Dak.
Frederick Ruthrauff Hoover, Kansas City, Mo.
Charles Thomas Jackson, Glasgow, Mo.
Henry Louis Jacques, Milpitas, Cal.
John Frank Jasienski, Lakewood, Ohio
Louis Raub Johnson, San Diego, Cal.

Irving Patterson Kane, Detroit, Mich.
Robert Newell Kinnaird, Des Moines, Iowa
George Leslie Kirby, Toledo, Ohio
Claude Milton Lambe, Raleigh, N. C.
Victor Lieb, Elephant Butte, N. Mex.
Hallett Edward McClintock, Omaha, Nebr.
Dana Quick McComb, New York City
John Frederic Mangold, Grinnell, Iowa
Horatio Seymour Mattimore, Albany, N. Y.
Clyde Leo Miller, Youngstown, Ohio
Robert Gaston North, Pittsfield, Mass.
Harry Neale O'Brien, Baltimore, Md.
George Henry Reussner, Malta, Mont.
Stanley Rush Sharts, Dayton, Ohio
Burr Henry Simpson, Cambridge, Ohio
Harvey Stanley, Boca Grande, Fla.
Arthur Leon Strong, Mt. Vernon, Wash.
Paul McGeorge Trueblood, Manila, Philippine Islands
Raymond Verner Warren, Pittsburgh, Pa.
Everitt Wyche Wilson, Ancon, Canal Zone, Panama
Dana Melvin Wood, Boston, Mass.

As Juniors

Matthew Laurence Carey, New York City
Alden Knowlton Fogg, Champaign, Ill.
Pedro Garcia, Lima, Peru
George Foden Rooking Hall, London, England
Jacob Joseph, Brooklyn, N. Y.
Jesse Lowe, Jr., Beardstown, Ill.
Emil Praeger, Brooklyn, N. Y.
Roger Bradshaw Quincy, New Orleans, La.
Spottiswoode Wellford Randolph, Chicago, Ill.
Walter Alan Richards, Catawba, N. C.
Arthur Ruettgers, Ann Arbor, Mich.
Reuben Benjamin Sleight, Denver, Colo.
William Glenn Sloan, Boise, Idaho.
Russell Alger Van Ness, McLean, Ill.
Adam Cooper Warfel, Philadelphia, Pa.
James McBarron Webster, New York City

The Secretary announced the transfer of the following candidates on December 6th, 1915:

From Junior to Associate Member

Ned Duncan Baker, Tientsin, China
Carl Donald Bossert, Washingtonville, Ohio

Fred Drexel Bowlus, San Fernando, Cal.
Daniel Elias Davis, Pittsburgh, Pa.
Carl E. Downing, Belzoni, Miss.
Joseph Jay Durfee, Brooklyn, N. Y.
Charles Sumner Henning, Jr., El Paso, Tex.
Richard Irvin, Pittsburgh, Pa.
Charles Christopher Kilby, New Haven, Conn.
Manley Osgood, Ann Arbor, Mich.
Joseph Price, Buffalo, N. Y.
Paul Francis Rossell, Wilmington, Del.
Walter Vanderbelt Scott, Buffalo, N. Y.
Charles Henry Shapleigh, New Orleans, La.
Lawrence Vinnedge Sheridan, New York City
Francis Marshall Smith, Pasco, Wash.
Everett Harold Swett, Montrose, Colo.
William Sidney Tomlinson, Columbia, S. C.
Alvin Dumond Wilder, Berkeley, Cal.

The Secretary announced the election of the following candidates on January 17th, 1916:

As Associate Members

Arthur Engh, Chicago, Ill.
Julian Clarence Feild, Denison, Tex.
Orlando Henry Frick, Milwaukee, Wis.
Albert Benedict Gidley, Marshfield, Ore.
John Owen Greenway, Sunnyside, Wash.
Seizo Hattori, Omuta, Fukuokaken, Japan
Lewis Stirling Hereford, Lake Charles, La.
Benjamin Alfred Howes, New York City
Roswell Sears Lander, Chattanooga, Tenn.
Charles Dix McArthur, Pittsburgh, Pa.
Archibald E. Palen, Denver, Colo.
William Copeland Pickersgill, Providence, R. I.
Royal Elmer Post, Meadow Creek, Wash.
Fred Dale Pyle, Montrose, Colo.
Alfred Emmet Roche, Troy, N. Y.
William Checkley Shaw, Jr., Seabrook, S. C.
Benjamin Single Thayer, La Mesa, N. Mex.
George Furbush Whittemore, Eureka, Cal.
Norman Cooper Woody, Minneapolis, Minn.

As Juniors

Albert Edward Broker, Milwaukee, Wis.
William Owen Cotton, Idaho Falls, Idaho
Alfred Michael Danzilli, Pittsburgh, Pa.
Ewing Sloan Humphreys, New York City
Harrison Aubrey Underwood, Durham, N. C.

The Secretary announced the transfer of the following candidates on January 17th and 18th, 1916:

FROM ASSOCIATE MEMBER TO MEMBER

ELLIOT CHIPMAN BROWN, New York City
EDGAR STONE CLOSSON, Montclair, N. J.
CLARKE PELEG COLLINS, Johnstown, Pa.
STEPHEN TRUESDELL DE LA MATER, Chicago, Ill.
HOMER MUNRO DERR, Pierre, S. Dak.
LLEWELLYN NATHANIEL EDWARDS, Toronto, Ont., Canada
SQUIRE EARNEST FITCH, Westfield, N. Y.
ROY COTSWORTH GOWDY, Fort Worth, Tex.
JULIUS REED HALL, Oak Park, Ill.
LEROY LEMOYNE HIDINGER, Memphis, Tenn.
GRANVILLE JOHNSON, Boston, Mass.
ARTHUR HERMAN MARKWART, San Francisco, Cal.
ALFRED BOARDMAN MAYHEW, Dayton, Ohio
ARTHUR TAPPAN NORTH, Chicago, Ill.
VINCENT PHILLIP ODONI, Tucson, Ariz.
IRWIN SELDEN OSBORN, Toronto, Ont., Canada
HARRY HARWOOD ROUSSEAU, Balboa Heights, Canal Zone, Panama
ROBERT LEMUEL SACKETT, Lafayette, Ind.
MORTON FRANKLIN SANBORN, Albany, N. Y.
JOHN LUCIAN SAVAGE, Boise, Idaho
NORTON WARE, San Francisco, Cal.

FROM JUNIOR TO ASSOCIATE MEMBER

RICHARD MANSFIELD MERRIMAN, Central Valley, N. Y.

The Secretary announced the following deaths:

WILLIAM W. FOLLETT, of El Paso, Tex., elected Member, July 5th, 1893; died December 30th, 1915.

CHARLES CONRAD SCHNEIDER, of Philadelphia, Pa., elected Member, February 6th, 1884; Director, 1887; 1898-1900; Vice-President, 1902-1903; President, 1905; died January 8th, 1916.

JAMES KNAPP WILKES, of New Rochelle, N. Y., elected Associate Member, June 3d, 1891; Member, April 3d, 1906; died January 9th, 1916.

DAVID WILLIAMS, of St. Johnsbury, Vt., elected Member, May 4th, 1898; died November 27th, 1915.

LOREN EDWARD HUNT, of San Francisco, Cal., elected Associate Member, June 3d, 1903; died January 9th, 1916.

LUDLOW VICTOR CLARK, of Philadelphia, Pa., elected Associate, October 4th, 1892; died December 28th, 1915.

The Secretary announced that the Board of Direction had decided that the next Annual Convention of the Society would be held in Pittsburgh, Pa., from June 27th to 30th, inclusive, and that a Local Committee of Arrangements had been appointed consisting of Messrs. George S. Davison, J. A. Atwood, R. A. Cummings, Richard Khuen, Morris Knowles, D. W. McNaugher, Emil Swensson, E. B. Taylor, W. G. Wilkins, and Paul L. Wolfel.

The Secretary presented the report of the Tellers appointed previously by the Board of Direction to canvass the Ballot for Officers for the ensuing year.

The President announced the election of the following officers:

President, to serve one year:

ELMER L. CORTHELL, New York City

Vice-Presidents, to serve two years:

ALFRED CRAVEN, New York City

PALMER C. RICKETTS, Troy, N. Y.

Treasurer, to serve one year:

LINCOLN BUSH, New York City

Directors, to serve three years:

VIRGIL G. BOGUE, New York City
ALEXANDER C. HUMPHREYS, New York City
OTIS F. CLAPP, Providence, R. I.
RICHARD KHUEN, Pittsburgh, Pa.
FRANK G. JONAH, St. Louis, Mo.
EDWIN DURYEA, JR., San Francisco, Cal.

On motion, duly seconded, a vote of thanks was tendered to the Tellers for their work.

Hunter McDonald, Past-President, Am. Soc. C. E., conducted Mr. Corthell to the chair.

Mr. Corthell addressed the meeting briefly.

Adjourned.

SPECIAL MEETINGS FOR THE DISCUSSION OF THE PROGRESS REPORT OF THE SPECIAL COMMITTEE ON MATERIALS FOR ROAD CONSTRUCTION

January 21st, 1916.—The meeting was called to order at 10.30 A. M.; W. W. Crosby, M. Am. Soc. C. E., Chairman of the Special Committee on Materials for Road Construction, in the chair; A. H. Blanchard, M. Am. Soc. C. E., acting as Secretary; and present, also, 147 members and guests.

The Chairman announced that the meeting had been called for the purpose of affording opportunity to discuss the Progress Report*

* Printed on pages 2721 to 2746 of Papers and Discussions in the *Proceedings* for December, 1915.

of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use.

Written discussions by Messrs. P. E. Green and C. R. Mandigo were read by the Secretary. The report was then discussed orally by Messrs. H. S. Mattimore, W. M. Kinney, A. H. Blanchard, J. H. MacDonald, T. J. McGovern, Edward D. Reed, R. A. Meeker, A. N. Johnson, K. H. Talbot, J. C. Bentley, P. H. Wilson, George C. Warren, E. H. Thomes, and H. B. Drowne.

Adjourned.

January 21st, 1916.—The meeting was called to order at 2.20 P. M.; W. W. Crosby in the chair; A. H. Blanchard acting as Secretary; and present, also, 147 members and guests.

The discussion of the Report of the Special Committee on Materials for Road Construction was continued by Messrs. Prévost Hubbard, T. J. McGovern, E. H. Thomes, William H. Connell, William C. Perkins, A. H. Blanchard, J. W. Howard, J. T. Myers, H. B. Drowne, W. W. Crosby, H. W. Durham, R. A. MacGregor, and W. B. Greenough.

Adjourned.

REGULAR MEETING

February 2d, 1916.—The meeting was called to order at 8.30 P. M.; P. K. Yates, M. Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 113 members and 18 guests.

The minutes of the meetings of December 15th, 1915, and January 5th, 1916, were approved as printed in *Proceedings* for January, 1916.

A paper by Alexander Allaire, M. Am. Soc. C. E., entitled "The Failure and Righting of a Million-Bushel Grain Elevator", was presented by the Secretary and discussed by Messrs. E. P. Goodrich and David Gutman.

A paper by William Cain, M. Am. Soc. C. E., entitled "Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion", was presented by the Secretary, who also read communications on the subject from Clifford Richardson, M. Am. Soc. C. E., and the author. The paper was discussed also by E. P. Goodrich, M. Am. Soc. C. E.

The Secretary read to the meeting a circular, which had just been issued, relating to the invitation of the United Engineering Society to join the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers in the joint ownership and occupancy of their building on West Thirty-ninth Street.

The Secretary announced the following death:

SLEDGE TATUM, of Washington, D. C., elected Member January 4th, 1910; died January 18th, 1916.

Adjourned.

OF THE BOARD OF DIRECTION

(Abstract)

January 17th, 1916.—The Board met at 10 A. M.; President Marx in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Bush, Connor, Cooley, Crocker, Davies, Endicott, Fuller, Hodge, Herschel, Keefer, Leonard, Loweth, McDonald, Metcalf, Montfort, Ockerson, Swain, Tuttle, and Williams.

A report of the Board for the year 1915 was adopted for presentation to the Society.

A Budget covering the expenditures for 1916 was recommended to the incoming Board for adoption.

The Secretary reported that papers had been served on the Society by Nora Stanton Blatch asking the Supreme Court for a peremptory mandamus to force the Society, and its Board of Direction, to recognize her as an Associate Member; that counsel had been engaged, and an answer prepared with great care, because the question involved was as to whether the Society has the right to choose its own members. The action of the Secretary was approved, and he was instructed, in case of an adverse decision, to carry the matter to the higher Courts.

A report was received from the Committee to Recommend the Award of Prizes, and the prizes were awarded in accordance with the recommendation of the Committee.*

The incoming President was authorized to appoint a Committee of three to take up jointly with similar committees of other Engineering Societies all Legislative and Constitutional matters.

A Local Committee of Arrangements for the Annual Convention to be held at Pittsburgh was appointed.

The resignations of 11 Members, 31 Associate Members, and 19 Juniors were accepted.

Action was taken in regard to members in arrears for dues.

The report of the Tellers appointed by the Board to canvass the Final Suggestions for Members of the Nominating Committee was received and ordered presented to the Annual Meeting.

The Secretary reported that, in the absence of President Marx, he had been requested by a sub-committee of the Naval Consulting Board to meet with them, and with the Presidents of the National Societies of Mining, Mechanical, Electrical, and Chemical Engineers, to formulate a plan for securing the necessary data in regard to industrial plants throughout this country, with a view to preparedness in the manufacture of munitions of war; that such a plan had been formulated, and it is understood that President Wilson has approved it, and will ask each of the five Societies named to nominate one representative from each State, thus forming a Board of five in each State

* See page 80.

who will become Associate Members of the Naval Advisory Board. Through these Boards, with the co-operation of the 35 000 members of the five organizations, it is expected that the necessary information will be secured promptly.

The incoming President of the Society was authorized to co-operate with the Naval Consulting Board in the manner specified.

Adjourned.

The Board reconvened at 3.55 P. M.; President Marx in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Bush, Connor, Cooley, Crocker, Davies, Endicott, Fuller, Harwood, Hawley, Hodge, Herschel, Keefer, Leonard, Loweth, McDonald, Metcalf, Montfort, Ockerson, Swain, Tuttle, and Williams.

A unanimous report was received from the Committee consisting of Clemens Herschel (Chairman), Robert Ridgway, Chas. Warren Hunt, Charles F. Loweth, John A. Ockerson, George F. Swain, and Hunter McDonald, which had been considering the offer made by the United Engineering Society that this Society join the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, in the joint ownership and occupancy of their building on West 39th Street.

This report, with such changes as may be necessary, was adopted as the report of the Board to the Society, and it was ordered to be sent out with a ballot.*

A report was presented by a Committee of the Board on the Licensing of Architects, etc., the recommendations of which were adopted. The report was ordered forwarded to the other three National Societies and to each of the Local Associations of this Society.†

Adjourned.

January 18th, 1916.—The Board met at 10.15 A. M.; President Marx in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Connor, Cooley, Crocker, Endicott, Greiner, Hawley, Herschel, Keefer, Loweth, McDonald, Metcalf, Montfort, Ockerson, Swain, and Williams.

A Report of Progress was received from William Barclay Parsons, Chairman of the Joint Committee on a Proposed Reserve Corps of Engineers.

A letter from the American Institute of Electrical Engineers was received suggesting that five members representing this Society be appointed to form with the other National Societies a Joint Committee to be known as the Pan-American Engineering Committee for the purpose of promoting a movement for a closer political, social, scientific,

* See page 130.
† See page 140.

commercial, and industrial association throughout the Americas. The matter was referred to the incoming President with power.*

Adjourned.

The Board reconvened at 5 P. M.; President Marx in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bontecou, Bush, Connor, Cooley, Crocker, Davies, Edwards, Endicott, Fuller, Greiner, Harwood, Hawley, Herschel, Keefer, Loweth, McDonald, Metcalf, Montfort, Ockerson, Swain, Tuttle, and Williams.

A report from the Membership Committee, which had been in session since the adjournment of the last Board meeting, was received and acted upon.

Ballots for membership were canvassed, resulting in the election of 6 Members, 67 Associate Members, and 21 Juniors, and the transfer of 20 Juniors to the grade of Associate Member.

Eighteen Associate Members were transferred to the grade of Member.

Applications were considered, and other routine business transacted.

Adjourned.

January 19th, 1916.—The Board met, as required by the Constitution, at the House of the Society, at 1.30 P. M., during the Annual Meeting, President Corthell in the chair; Chas. Warren Hunt, Secretary; and present, also, Messrs. Bogue, Bontecou, Bush, Clapp, Cooley, Craven, Crocker, Davies, Duryea, Endicott, Fuller, Greiner, Harwood, Haskell, Hawley, Herschel, Jonah, Keefer, Khuen, McDonald, Marx, Montfort, Ockerson, Swain, and Tuttle.

The President announced that the first business was the election of a Secretary.

Mr. Hunt retired.

Chas. Warren Hunt was nominated, and unanimously elected Secretary.

Mr. Hunt was recalled.

The following Standing Committees of the Board were appointed: Finance Committee: Clemens Herschel, Chairman, George W. Fuller, Alfred Craven, Otis F. Clapp, and F. G. Jonah; Publication Committee: Arthur S. Tuttle, Chairman, Virgil G. Bogue, Alex. C. Humphreys, J. E. Greiner, and J. F. Coleman; Library Committee: George A. Harwood, Chairman, J. V. Davies, H. S. Crocker, M. E. Cooley, and Chas. Warren Hunt.

The resolutions† offered by R. S. Buck, M. Am. Soc. C. E., at the Annual Meeting, and which were referred to the Board of Direction, were referred with power to a Committee consisting of Messrs. Corthell, Swain, and Hunt.

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* See page 142.

† See page 105.

The following motions were adopted:

"Resolved: That the meetings of the Board this year be held quarterly, the first to be held on the Tuesday before the third Wednesday in April (18th); the second to be held in Pittsburgh on the last two days of the week preceding the Annual Convention (June 23d-24th); the date of the third and fourth meetings to be determined later."

It was also determined that intermediate meetings of the Membership Committee and of the Board be authorized for the consideration of applications for admission and for transfer only.

Adjourned.

REPORT IN FULL OF THE SIXTY-THIRD ANNUAL MEETING, JANUARY 19TH AND 20TH, 1916.

Meeting called to order.

Wednesday, January 19th, 1916 (10 A. M.).—Charles D. Marx, President, in the chair; Charles Warren Hunt, Secretary; and present, also, about 500 members.

THE PRESIDENT.—The meeting will please come to order. We will now listen to the report of the Board of Direction, copies of which are being passed around at the present time. The Secretary will please read it.

Reports of the Board of Direction, Secretary, and Treasurer.

The Secretary presented the Report of the Board of Direction,* and the Report of the Secretary.†

THE PRESIDENT.—Is Mr. Bush here? If not, the Secretary will please read the Treasurer's report.

The Secretary read the Report of the Treasurer.‡

THE SECRETARY.—On the general balance sheet as printed in this pamphlet, gentlemen, there is a typographical error, a mistake of the printer. On the side headed "Assets", the estimated value of the three lots, the actual cost of which was $185 406.20, is given at $290 000, in accordance with the valuation made by the New York Real Estate Board. Then, instead of the word "Furniture", there should be "Building (cost, less 2% annually for depreciation), $130 621.59"; and then, "Furniture (cost, less 50% depreciation), $10 529.38". The rest of it is correct. I do not think it is necessary to read this statement.

THE PRESIDENT.—I do not think so. It is all before the Members.

A motion that the reports of the Board of Direction, the Secretary, and the Treasurer be received and placed on file is in order, and I will entertain such a motion.

GARDNER S. WILLIAMS, M. AM. SOC. C. E.—I so move.

(Motion duly seconded.)

THE PRESIDENT.—Those in favor of the motion say "aye"; contrary, "no". It is so ordered.

The next is the report of the Committee appointed to recommend the award of prizes for 1915.

Report of the Committee to Recommend the Award of Prizes.

THE SECRETARY.—The Board of Direction has received the following report from the Committee:

"TO THE BOARD OF DIRECTION
AMERICAN SOCIETY OF CIVIL ENGINEERS:

"The undersigned, a Committee appointed to Recommend the Award of Prizes for this year, beg leave to recommend the following awards:

"The Norman Medal to Allen Hazen, M. Am. Soc. C. E., for his paper entitled 'Storage to be Provided in Impounding Reservoirs for Municipal Water Supply'.

* See *Proceedings*, Am. Soc. C. E., Vol. XLII, p. 13 (January, 1916).
† See *Proceedings*, Am. Soc. C. E., Vol. XLII, p. 20 (January, 1916).
‡ See *Proceedings*, Am. Soc. C. E., Vol. XLII, p. 23 (January, 1916).

"The J. James R. Croes Medal to Richard R. Lyman, Assoc. M. Am. Soc. C. E., for his paper entitled 'Measurement of the Flow of Streams by Approved Forms of Weirs with New Formulas and Diagrams'.

"The Thomas Fitch Rowland Prize to Charles W. Staniford, M. Am. Soc. C. E., for his paper entitled 'Modern Pier Construction in New York Harbor'.

"The James Laurie Prize to J. E. Greiner, M. Am. Soc. C. E., for his paper entitled 'Coal Piers on the Atlantic Seaboard'.

"The Collingwood Prize for Juniors to George Schobinger, Assoc. M. Am. Soc. C. E., for his paper entitled 'Colorado River Siphon'.

"Respectfully submitted,

"DESMOND FITZGERALD,
WM. H. BURR,
GEORGE GIBBS,
"Committee."

And I have to report that the Board of Direction has awarded the medals and prizes in accordance with those recommendations.

Appointment of Nominating Committee.

THE PRESIDENT.—The next business is the report on members to serve on the Nominating Committee. You have the report of the Board on that?

THE SECRETARY.—Yes, sir. The Board, having canvassed the final suggestions received from the various districts, reports that there was a total of 1 670 suggestions received.

"District No. 1: Total suggestions received, 323, as follows:

E. J. Fort	215
E. P. Goodrich	77
J. F. Sanborn	18
Scattering	13"

There are two or three names of men who are ineligible, but I do not think it makes much difference. Shall we take them up by districts?

THE PRESIDENT.—I think so. The list of candidates in District No. 1 has been read, and a motion that some one be declared the representative of that district is now in order. Will some one make a motion with reference to District No. 1?

JOHN A. OCKERSON, PAST-PRESIDENT, AM. SOC. C. E.—I move that the gentleman who had the highest number of votes in District No. 1 be declared elected as member of the Nominating Committee.

THE SECRETARY.—E. J. Fort.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, you have heard the motion. All who are in favor say "aye"; contrary, "no". It is so ordered.

Nominating Committee (continued).

THE SECRETARY.—"District No. 2: Total suggestions received, 202, as follows:

S. E. Tinkham	89
Frederic H. Fay	26
A. B. Hill	21
H. R. Safford	21
R. S. Lea	17
Henry Holgate	15
Scattering	13"

GEORGE F. SWAIN, PAST-PRESIDENT, AM. SOC. C. E.—Mr. President, I move that Mr. S. E. Tinkham be appointed a member of the Nominating Committee for District No. 2.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, you have heard the motion. Those in favor of it say "aye"; contrary, "no". It is so ordered.

THE SECRETARY.—"District No. 3: Total suggestions received, 194, as follows:

W. R. Hill	71
F. W. Cappelen	70
Henry E. Riggs	31
W. L. Darling	11
Scattering	11"

A MEMBER.—I move that Mr. Hill be appointed a member of the Nominating Committee for District No. 3.

MR. WILLIAMS.—I wish to call attention to the fact that the present representative of the Nominating Committee who holds over is Mr. J. A. O'Connor, who is Terminal Engineer of the New York State Barge Canal. If Mr. Hill is selected to represent the district, it places two men, of the same organization, practically, on the Committee, and also two in the eastern end of the district. I would call attention to the fact that the retiring member of the Nominating Committee from this district is Professor F. E. Turneaure, of the University of Wisconsin.

In view of the fact that the votes cast—a large majority of them—came from the western end of the district, Mr. Riggs being a resident of Michigan, and Mr. Cappelen of Minnesota, and that Mr. Cappelen's vote is only one less than Mr. Hill's, I move that Mr. Cappelen be declared a member of the Nominating Committee from District No. 3.

(Motion seconded.)

HORACE ANDREWS, M. AM. SOC. C. E.—I think that the speaker is in error. Mr. O'Connor is no longer connected with the State service, but Mr. Hill is the President of the Albany Society of Civil Engineers, and is very well known to a large number here, and he has received

the largest number of votes. Consequently, I think he ought to be considered for this position.

THE PRESIDENT.—The only motion is that made by Mr. Williams. The first motion was not seconded.

A MEMBER.—Will the Secretary give the number of the two highest.

THE PRESIDENT.—Certainly.

THE SECRETARY.—W. R. Hill has 71; F. W. Cappelen, 70.

THE PRESIDENT.—The motion before the meeting is on the election of Mr. Cappelen.

A MEMBER.—I desire to second the nomination of Mr. Hill, and to say that, notwithstanding the fact that you have already a member in the East, it would be unsafe to depart from the policy which we have pretty generally followed, of taking the opinion of the majority.

THE PRESIDENT.—Then your motion would be in the nature of an amendment to the original motion made by Mr. Williams?

A MEMBER.—I second the original motion.

A MEMBER.—I moved that Mr. Hill be the nominee, and a gentleman has seconded my motion, and I presume that is in order.

THE PRESIDENT.—I suppose the best thing to do would be to take a vote on the two candidates, and let the meeting decide it that way.

MR. WILLIAMS.—Allow me to say one word more, Mr. President, in response to the last speaker. We are not departing from a custom of this meeting in setting aside the result of the ballot. I would call attention again to the fact that Mr. Cappelen's votes numbered 70, and Mr. Riggs received 31. Mr. Hill received 71, and Mr. Darling 11. The majority of votes came from the western end of the district. The eastern end of the district has a member of the Nominating Committee. Now, I think that is unfair. I think that the members of the Society in the western end of the district are entitled to this representation. I have no objection to Mr. Hill, and I assume that his turn would come next year; but I cannot see that it is just to a district which extends from the Atlantic Ocean to the western boundary of Minnesota, to place two members in the northeastern corner of New York, and ignore the rest of the membership. I certainly hope that my motion will prevail.

THE PRESIDENT.—If there is no objection, I think we will take a vote on the two candidates, and I suggest that those in favor of the nomination of Mr. Cappelen please raise their right hands, and the Secretary will count the votes.

THE SECRETARY.—93.

THE PRESIDENT.—Those in favor of Mr. Hill's nomination please raise their right hands.

THE SECRETARY.—27.

Nominating Committee (continued).

THE PRESIDENT.—In accordance with the vote, I declare Mr. Cappelen elected as representative of the Nominating Committee for District No. 3.

THE SECRETARY.—"District No. 4: Total suggestions received, 240, as follows:

H. H. Quimby	137
M. J. Riggs	45
A. J. Himes	43
Scattering	15"

RICHARD L. HUMPHREY, M. AM. SOC. C. E.—Mr. President, I move that Mr. Quimby be appointed member of the Nominating Committee for District No. 4.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, those in favor of that motion please say "aye"; contrary, "no". It is so ordered.

THE SECRETARY.—"District No. 5: Total suggestions received, 296, as follows:

E. M. Layfield	165
Baxter L. Brown	116
R. C. Barnett	9
Scattering	6"

MR. OCKERSON.—Mr. President, in the first round the southern contingent cast 90 votes, and the Chicago contingent, which was apparently asleep, cast only 12 votes. When they woke up from their normal lethargy, they got out and beat us; and I move that Mr. Layfield be declared a member of the Nominating Committee from District No. 5.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, you have heard the motion. All those in favor say "aye"; contrary, "no". It is carried.

THE SECRETARY.—"District No. 6: Total suggestions received, 191, as follows:

W. B. Gregory	109
J. C. Nagle	34
B. M. Hall	19
T. U. Taylor	15
Scattering	14"

HUNTER MCDONALD, PAST-PRESIDENT, AM. SOC. C. E.—I move that Mr. Gregory be declared elected member of the Nominating Committee for District No. 6.

(Motion duly seconded.)

THE PRESIDENT.—Gentlemen, you have heard the motion. Those in favor say "aye"; contrary, "no". It is carried.

THE SECRETARY.—"District No. 7: Total suggestions received, 224, as follows:

J. B. C. Lockwood	104
D. C. Henny	42
D. D. Clarke	34
Scattering	44"

THE PRESIDENT.—I will entertain a motion.

THE SECRETARY.—J. B. C. Lockwood is the top man.

A MEMBER.—I move that Mr. Lockwood be appointed member of the Nominating Committee for District No. 7.

(Motion duly seconded.)

THE PRESIDENT.—Those in favor of the motion signify by saying "aye"; contrary, "no". The motion is carried. It is so ordered.

Report of Committee on Materials for Road Construction.

The report of the Special Committee on Materials for Road Construction, Mr. W. W. Crosby, Chairman.

W. W. CROSBY, M. AM. SOC. C. E.—The Committee has prepared a semi-final report, and as it has been printed in *Proceedings** and is rather long and technical, I will not take the time of the meeting to read it, but will simply ask that the report be received, and that the Committee be continued, in order that it may complete its revision of its previous report, and then report in the near future.

THE PRESIDENT.—If there is no objection, it is so ordered.

E. W. STERN, M. AM. SOC. C. E.—On the question of road materials——

THE PRESIDENT.—Will you step up in front? I think the stenographer will get your words better.

Discussion on Committee on Materials for Road Construction.

MR. STERN.—The Special Committee on Materials for Road Construction and on Standards for their Test and Use has been in existence for quite a number of years—six or seven, I believe.

A year ago its functions were enlarged to deal with all road materials. The whole question of road construction, of course, as every one knows, is a most important one. One of the most important things before the country to-day, in engineering work, is the construction of roads and highways. To me the report just presented has been very disappointing. I believe it has been to others. Now, this great Society of ours should take some action in regard to this important thing, such as it has, for instance, in connection with reinforced concrete construction, where its recommendations were quite authoritative, and very beneficial, I believe.

A MEMBER.—It is a little difficult to hear what Mr. Stern has to say. Will he speak a little louder.

MR. STERN.—Now, in order to achieve results commensurate with the importance of this Society in the country, it would appear to me

* See *Proceedings*, Am. Soc. C. E., for December, 1915, pages 2721 to 2746 of Papers and Discussions.

Discussion on Committee on Materials for Road Construction (continued).

that the constitution of that Committee should be enlarged or changed so as to produce some results. So far, we have had recommendations on bituminous materials. The report this year, consisting of seven pages, is, as the Committee says, of the most general kind of recommendations. The Committee also seems to be under the impression that its scope is limited. I quote from its report:

"It should be distinctly understood that the Committee has deliberately refrained from including in this report such conclusions regarding any material or method as appear to have been generally agreed on."

I should like to ask why it deliberately refrained from giving us this valuable information, which not only we, but the entire country, is interested in.

The Committee, in its report, of course, calls attention to the pressure of other matters, which prevented a proper consideration of the criticisms or discussion offered. That is another argument, Mr. Chairman, why this Committee should be composed so that it can produce results. As it is to-day, the question of road building is taken up by other societies, none of them having the standing of this Society. All these societies are doing good work, but there still remains some body, a National body, that should act, and the position that we hold in the community is such that we should take this matter up and present strong recommendations.

This Society is in a position to do it. It must be done, however, by the enlargement of that Committee. I move, Mr. Chairman, therefore, that it is the sense of this meeting that this Committee should be enlarged to at least fifteen members.

THE PRESIDENT.—I presume, Mr. Stern, that your recommendation is to the Board of Direction.

MR. STERN.—To the Board of Direction.

(Motion duly seconded.)

THE PRESIDENT.—A motion has been made and seconded that this meeting recommend to the Board of Direction that the Special Committee on Materials for Road Construction be enlarged to a membership of fifteen. Is that correct?

MR. STERN.—Yes, sir.

THE PRESIDENT.—You have heard the motion, which is before you now for discussion.

F. LAVIS, M. AM. SOC. C. E.—I wish to endorse strongly all that Mr. Stern has said. Personally, I was not particularly interested in the construction of roads until the early part of last year, except that I like to have a nice, smooth road to ride over.

Some eight or ten months ago, I became directly interested in the question of the construction of roads, and naturally looked for information where one might best expect to find it, and was surprised

at the dearth of really valuable information accessible to a person who had to build a road; and I think it is well within the scope of the activities of this Society to take up the subject actively.

THE PRESIDENT.—You have heard the motion. Is there any more discussion? If not, I will put the motion.

MR. CROSBY.—May I say a word? I probably appreciate the importance of road construction as well as any member of the Society; and also appreciate the desire of many members of the Society and others, who for the first time, and within recent years, have had the responsibilities of road construction laid on their shoulders; and I appreciate, also, the dearth of literature on the subject—reliable literature.

The Committee has not, however, from its constitution and the assignment of its responsibilities, felt that one of its duties, or its final duty, was to prepare a textbook on road construction. The Committee was a Special Committee on Bituminous Road Materials, at the start, and a year ago its activities were enlarged to include the non-bituminous materials. Incidentally, of course, it is obliged to deal with methods, to some extent. However, in order not to attempt more than the opportunity offered for the proper performance of the duties, and in order to perform the duties within reasonable limits, as clearly and as fully as possible, the Committee has refrained from attempting to put out information over its signature—over its endorsement—which it was felt was more or less common knowledge, especially among those who were engaged, and had been for some time engaged, in road building.

It has steadily refrained from loading up its reports with generally accepted conclusions, and has attempted to get out the greatest number of new conclusions, or conclusions on disputed points, which the limited time available offered.

Now, if the Committee is to be one to prepare a general textbook on road building, so that any engineer who may have been in architectural or other work, and suddenly becomes loaded with the responsibility of highway and street construction, can with facility turn to that volume and produce results for his employers, I submit that the Committee has a considerable job before it; and it might be wise to enlarge the Committee to make arrangements for its members to give the requisite time from their ordinary duties toward its work, on some such basis as would warrant men capable of performing the duties giving the necessary time to it, and then allow it sufficient time to produce satisfactory results in rather a large field.

On the other hand, if the original conception of the Committee is to be carried out, and a report made of some value on a limited portion of the field, leaving to others the production of literature on other portions, far larger, perhaps, of the whole field, it is a question whether the enlargement of the Committee is desirable.

Discussion on Committee on Materials for Road Construction (continued).

You all recognize, I am sure, the difficulties of attaining as great a percentage of attendance with a large committee as with a small one. The meetings of this Committee—consisting of seven members—have been almost always full meetings. There have been only one or two occasions where any one has been absent. The Committee has had a number of meetings, I should say, perhaps, ten during the past year; and if the Committee were much larger, it is a question whether anything like the record for attendance could be attained, and, consequently, whether the actual results produced would be any more definite, or perhaps any more in volume, than they have been.

Mr. Stern is slightly in error when he refers to seven pages as the report, because the report contains actually twenty-three pages, and the sixteen pages annexed to the report occupied more time of the Committee than the seven pages of the text. As Chairman of the Committee, I do not want to be misunderstood. I do not want to be understood as objecting to the addition of any men to the Committee, if the result wished by the Society would seem to be advanced, but I speak from my own experience as Chairman; and there is some question on that point. I do not wish, either, to take your time now to enter into any argument or extended discussion of the report, because the Board of Direction has kindly set aside Friday of this week for a special meeting of the Society, at which the report can be discussed in detail; and I merely ask you to consider what I may have said on the point.

MR. WILLIAMS.—Mr. Chairman, I would like to call the attention of the membership at this time to certain conditions which have come to the attention of the Board of Direction within the past two or three months. Those conditions are that this matter of Special Committees is running away with the Society. The amount expended on the work of Special Committees during the past year has been found to be a greater burden than the income of the Society warrants at the present time; and it has been decided—or at least recommended by the present Board of Direction to its successor—that a reduction of the allowance for Special Committees be made next year. I believe it is very important that such reductions be made; and I think that we should look particularly to quality rather than to quantity on our committees; and I, therefore, hope that no suggestion of an increase of members of any committee will be recommended by this Meeting.

JAMES OWEN, M. AM. SOC. C. E.—Mr. Chairman, I do not suppose that there is a more important subject——

THE PRESIDENT.—Will you kindly come forward, Mr. Owen?

MR. OWEN.—I do not suppose that there is a more important question before the people of the United States than this question of roads. I agree with Mr. Stern somewhat in saying that the American Society of Civil Engineers is probably the most prominent body that

is capable of handling the matter; and I also agree with him that the American Society of Civil Engineers has done less on the subject of road construction than any other organization in this country. Why that is, I do not know. Of course, as it is at present, road construction is in an inchoate condition. Ideas are prevailing now that did not exist before.

The ideas existing four years ago on road construction are now obsolete, and it seems to me that this Society should take hold of this matter as a business proposition, or rather as a professional proposition, for the benefit of the country.

Now, the Committee has been sitting for four or five years, the restriction that it has imposed on itself in treating on one subject—because I do not know the originally contemplated scope of this Committee—was to take up the leading questions of road construction; but, having restricted itself, as is stated, it seems to me that it is time that that restriction, although self-imposed, should be removed. Of course, I have been interested in the road movement for a good many years, and I know the trouble existing among road engineers in getting satisfactory results; and it seems to me that it is not improper, with all due deference to Mr. Williams, that this Society should take up that subject in the broadest way and most patent form.

I, of course, may feel a little personal in this matter, because in the publications of the Society, I notice that when I made a discussion last year at the meeting of the Society, the Committee on Publications, for some peculiar reason of its own, suppressed it. Now, I think that is not orthodox. I never knew that any Board or officer of this Society was empowered to suppress oral communications that were officially taken by the stenographer and submitted to me for revision. I revised it, and it was returned with a notification that the Publication Committee had decided not to print it.

Now, gentlemen, to my mind, that is something extraordinary, and I still adhere to my idea that this Society should do the best it can, if the members of the present Committee conceive themselves capable of doing it, or the Society conceives them capable of doing it, I say, let this number stand, but my idea is that this Committee should be enlarged to give this country better knowledge of road work.

MR. STERN.—Mr. Chairman, I regret somewhat that I must speak once more on this subject, which, it is insinuated by the Chairman of the Committee, I know nothing about.

Assuming, for the sake of argument, gentlemen, that I, as a member of the Society of Civil Engineers, know nothing whatever about road building; assuming that I happen to be in a position where it is necessary to know something about road building; is that any reason why a committee appointed several years ago for the purpose

Discussion on Committee on Materials for Road Construction (continued).

of giving us information on this very important subject, should use that as an argument?

What is the object of this Society? I ask you that question. Is it to broaden the knowledge of those who happen to know nothing about some particular specialty, or only to patch up some minute matters which are not accepted as common knowledge, for the specialists?

I reject the proposition that there is anything accepted in road building. My own experience in road building goes back a great many years, probably more years than the Chairman of the Committee seems to think; and I have failed to see anything accepted in road construction throughout the United States or any other country.

Gentlemen, we do not want a textbook. Any statement like that is perfectly absurd. We want recommendations by a Committee appointed by this authoritative body—definite recommendations.

I apologize to the Chairman for saying that there are only seven pages in the report. There are seven pages in the report, plus appendices. Among those appendices are blank forms for getting information regarding traffic, *et cetera*; blank forms for the computation of costs, *et cetera*.

I do not see why a report should be loaded up with that kind of stuff at all.

We want to know how a tar-macadam road should be laid, or a bituminous-macadam concrete should be mixed. We want recommendations from this Committee. We do not want a specification. We want its opinion; that is why it was appointed. That it has not given us.

I believe, however, that, as hundreds of millions of dollars are being spent annually in this country, we should go into this thing, not as an amateur proposition, or on a narrow, limited scale, but on a very large, broad one, and that the functions or limitations of the Committee should not be restricted. If it is necessary to reorganize the Committee in order to do this, it should be done.

I am sorry to have to make this statement. I made a motion, that the Chairman failed to put to the meeting, on the enlargement of the Committee——

THE PRESIDENT.—The motion before the meeting is on the enlargement of the Committee.

MR. LAVIS.—I desire to reply to the statement of Mr. Crosby. We do not want a textbook on road building. I think we have as much right to have the principles of road building enunciated by a Committee of this Society, as to have the principles which underlie the operation of our roads.

When I spoke of having the construction of roads thrust on me unexpectedly, it was not as an engineer that I spoke; it was as an officer of the town in which I live and of the county in which I live.

I was asked to decide between the opinions of a number of engineers who were supposed to be expert in road building.

I wrote to the members of the Special Committee of the American Society of Civil Engineers, which was the first body of experts that I could lay my hands on; and Mr. Crosby, among others, was courteous enough to reply to my letters, and give me some information; but, after I had gathered together all the information I could get, both gratuitously from Mr. Crosby and other members of the Society, and paid information from other engineers, I found it was up to me to decide between the opinions of engineers who made the recommendations; and there was no formulation of principles on which roads should be built.

MR. CROSBY.—I am sorry to have to rise again to perhaps a question of personal privilege. Whereas the personal note has been injected, to some extent, in the discussion, I feel that I ought not to sit still and allow it to pass. Mr. Stern stated that I rather scoffed at his knowledge of road building. I did nothing of the kind. I made no personal allusions. My statement was very general, and was not intended to apply to Mr. Stern, unless he chose to apply it to himself. I do not know Mr. Stern's history well enough to know whether it would apply.

I am very glad that the gentleman who just spoke referred to the fact that I was able to give him some information, which I cheerfully did, and to the best of my ability, and I may say that I am only sorry that I was not employed as one of the paid experts.

However, I want to call attention to the fact, which you will all recognize, I am sure, that this Committee has not, of its own accord, limited its work. As a matter of fact, if you will take the trouble to read the reports of previous years and of this year, the question will undoubtedly arise in your own mind as to whether or not the Committee has not actually gone outside the scope of its assignment.

If you will read the title, "Progress Report of the Special Committee on Materials for Road Construction and on Standards for their Test and Use", you will see that the Committee has no right to consider many principles of road building which undoubtedly would be enunciated by a responsible authority. To this Committee was assigned a limited subject. It has endeavored to keep within the limits of its scope, as far as practicable, but has unquestionably gone outside the strict limits in its effort to perform its duties; and I submit that it is not a fair reflection on the Committee to insinuate that it has deliberately restricted its activities.

The Committee admits, as I explained before, that it has not been including in its reports a lot of well-known—at least, among highway engineers of experience—data concerning road materials. Possibly it would be advantageous to include them.

Discussion on Committee on Materials for Road Construction (continued).

The Committee would like to take the time and do the work necessary to do that, but, in view of the other matters seemingly much more important pressing on it, it has felt obliged to omit these hackneyed things.

Now, as regards the forms, I simply want to say that engineers want the orderly accumulation of facts; and that in the attempt to secure them, as just narrated by the previous speaker, great difficulty is had, not only in getting the facts, but in getting them in an orderly and comparable manner; and the Committee feels that one of its accomplishments—if it shall so result—is the provision for an orderly manner of securing facts necessary in highway construction, not only for the solution of present troubles, but of future troubles, in such a manner as is provided by the forms, which they spent considerable time in framing.

MR. METCALF.—Mr. Chairman, it seems to me that this question is one of great importance to this Society. It is certainly not a personal one. We are, however, face to face with the fact of the expense of work of this sort to the Society. Now, aside from that matter, which is a vital one, the important question to this Society is: What is the most effective way of carrying on such an investigation and of accomplishing results?

I must confess that, as a result of my experience on committee work, I have come to feel that the most effective work can be done by the smaller committee, and that, in having so large a committee as ten or fifteen men, you not only subject the Society to very heavy and unnecessary burdens of expense, but you actually run the risk of getting less effective results.

It means that the discussions within the Committee may become very burdensome, and to such an extent that members of the Committee may feel even that they cannot give the time to listen to such long discussions of the subject. In other words, it may not be any more productive of good results.

Therefore, I hope—believing, as I do, that the most effective work is done by smaller committees—I hope that the Committee will not be enlarged, as suggested by Mr. Stern; and I would move as a substitute or an amendment to his motion, Mr. Chairman, that the Board of Direction give consideration to the question of the desirability of increasing the membership of the Special Committee on Road Materials, and the scope of the work of the Committee.

THE PRESIDENT.—That is, the Board of Direction?

MR. METCALF.—The Board of Direction.

THE PRESIDENT.—Is there a seconder to that amendment?

(Motion duly seconded.)

THE PRESIDENT.—The question is on the amendment submitted by Mr. Metcalf.

MR. STERN.—As to the desirability of enlarging the Committee, the question arises generally as to how much a committee of seven men can do in connection with this great question.

The Society has a right to ask that we get results within the life of those who are living now. At the present rate of procedure, it does not look much as if we were going to get that. How can we get that? By enlarging the Committee with the right kind of material; by putting men on the Committee who will work, and eliminating those who will not work.

There is no reason why a committee of fifteen should not do twice as much work as a committee of seven, by the appointment of sub-committees. The committee could be sub-divided into two sub-committees, consisting of seven each, and if those sub-committees are selected properly, this committee should, in the course of one-half the time, produce authoritative recommendations and reports.

I hope, therefore, that the Board of Direction will consider this matter, if the motion prevails.

EDGAR MARBURG, M. AM. SOC. C. E.—Mr. Chairman, I do not think that it ought to go unchallenged that intimation has been made that the appointment of committees is not a good means of doing effective work. It is not necessary to cite examples of many other societies, whose principal work is directly committee work, to refute that statement; and I do not think it ought to go unchallenged.

I think that committee work has advantages which are so palpable that to disregard it would be a reflection on the Society. Committee work implies that some one selects the papers, that the Society or the Board of Direction selects a worth-while subject, and assigns it, presumably, to the most suitable men in the Society to deal with that subject. It also means that the report of such a committee expresses the views of the members composing it. Nor is it necessary to arrive at the gist of the committee's reports, at the essence of the subject, to wade through a paper and discuss it. All that has been done and sifted out by the committee itself.

Nothing can be put forward, in my judgment, more authoritative, therefore, through our publications, than the labors of a properly constituted committee, as indicated by its reports, on a worth-while subject.

Now, the intimation that this Society ought not to give support to encourage committee work because, forsooth, it has not money, is unworthy of consideration. How about the other societies who have almost nothing compared to what this Society has? It is not necessary to mention names. I speak because of the fact that I happen to be connected with an organization that does all its work practically through committees, and the work speaks for itself; but I am not

Discussion on Committee on Materials for Road Construction (continued).

going to mention names. I take it that this body is too well informed to allow that sort of argument to have weight.

And again, if a committee is properly constituted, and applies itself seriously and conscientiously to its task, should not that committee be backed up? Are we here to pass judgment on whether or not a request on the part of the committee to be enlarged to fifteen, should not be granted? We are asked to vote in a matter of that kind against a committee of our appointment, and to say that a committee of fifteen is unwieldy. Do you reckon with the fact that most important work is done by sub-committees? Ought we to sit in judgment on the report of the Special Committee, Mr. Chairman, the members of which are particularly competent to deal with that phase of the subject, whatever phase of the subject happens to be submitted to a Special Committee, without knowing anything of the Committee, but knowing it was appointed by the Board of Direction, and feeling confident that it knows its business?

I would be prepared to vote and lend my voice to any recommendation on the part of the Committee for its enlargement, whether it be 15 or 50——

THE PRESIDENT.—May I call your attention to the fact that the enlargement of the Committee is not asked for by the members of the Committee, but by a member outside the Committee, who would like you to enlarge it.

MR. MARBURG.—Has the Committee expressed an opinion on the subject?

THE PRESIDENT.—It has opposed it.

GEORGE W. TILLSON, M. AM. SOC. C. E.—Mr. President, I was not present when this subject was first introduced, when the report was introduced, but I have been here long enough to understand that there is some dissatisfaction with the report of the Committee.

There has been an intimation that the Committee, if it continues at its present rate of procedure, will not be through during the life of many here present; also that the delay in such procedure is not necessary if the Committee works.

I would like to call your attention to the fact that when this Committee was appointed, it was appointed to investigate bituminous materials only, and that a year ago last June the Committee was instructed to continue itself, to begin investigations and make a report on materials other than bituminous, as well as bituminous materials.

It has been stated that this report contains only seven pages as a result of the Committee's work, and appendices regarding forms have been referred to.

If the gentleman who made that remark will read this report, and read Appendix B, and see what that information amounts to, and then form an adequate idea of how much time and investigation is neces-

sary to form such conclusions and put them before such a body as this, as well as taking into consideration all that this report says about materials other than bituminous, I think he will conclude that, within a year and a half, with the amount of time that busy men have to give to such a subject, the Committee has accomplished something.

This Committee, as has been said, consists of seven members. They are busy, active men, employed in actual business, and it is difficult for them to get away. As the Chairman said, at these Committee meetings nearly every member has been present every time; and it not only means giving up the time necessary to attend the meetings, but it also means giving up time outside of the different meetings to investigate things and report to the Committee, and these reports of these different men—call them sub-committees or not—are considered and thrashed out, and the man who makes the recommendation in the Committee has to back it up, just the same as the Committee has to back up its report when it is presented to this body.

I do resent any insinuation that this Committee has not worked, that it has not given its time, and all the time that a committee of busy men can be expected to give to the performance of its duties, much as they would wish to give more.

Now, as to the enlargement of the Committee, I think that most of those who have been engaged in committee work of this kind will agree that it is impossible for a large committee as a whole to get together and discuss these important points.

What is the object of appointing a committee or a body, anyway? It is for some one to take up and consider and work out these things, and report them. If you have no confidence in the Committee, or if you think the Committee is not the proper one, it is easy to get others who can do the work. The personnel of the Committee should be considered when it is made up; but the trouble with a large committee—and that has been proven in this case, with the size that it is now—when the different men come in and make their reports, it often spends half a day or a day discussing some matter which, to the majority of the people, would not be considered of special importance, and if this Committee, or any committee, is to receive the report of a sub-committee without considering it, and without giving its own particular attention to it, what is the benefit of the sub-committee? And the more you have on that sub-committee, the more difficult it is to get results that will be satisfactory to the Committee, and satisfactory to all others, because a committee wants to put in a unanimous report.

If you put in a majority report and a minority report, you leave the subject open. There is nothing settled. The people say the Committee has not settled anything because the members cannot agree among themselves. So I believe that a committee of seven is fully

Discussion on Committee on Materials for Road Construction (continued).

large enough, and personally should be very sorry to see it increased any, not to say to such a number as fifteen.

A. E. PHILLIPS, M. AM. SOC. C. E.—I want to call attention to the fact that the last speakers have not been speaking to the motion before the meeting, which, as I understand it, is an amendment by Mr. Metcalf, suggesting the widening of the scope of the Committee and, in particular, the size of the Committee.

THE PRESIDENT.—He suggested that the matter of enlarging the Committee and the scope of its work be recommended to the Board of Direction.

MR. PHILLIPS.—His amendment was to enlarge the scope of the Committee, particularly the size of the Committee.

THE PRESIDENT.—He suggested that the matter of enlarging the Committee and the scope of its work be recommended to the Board.

MR. PHILLIPS.—His amendment was to enlarge the scope of the Committee, particularly the size of the Committee. I would like to say that I believe that the sense of the Society is to have a committee doing work of this character under a title that apparently is broad—I believe that the sense of the Society is to have its scope enlarged sufficiently to cover the subject with reasonable fullness, unless another Committee is doing the work along broader lines.

I think the motion Mr. Metcalf made is a most excellent one, and I do not think that the members of the Committee or their defenders, who seem to be a little sore that there should be any criticism of their work, ought to feel so, but rather ought to feel that the idea of the Society is not to reflect upon that Committee, but to get wider results than apparently are contained in the report of the Committee, and to cover the subject in a broad way.

I do believe that in a subject developing as rapidly as road building has, a committee of this sort should not confine itself to one class of materials, as it did last year, but should cover all classes of materials, should cover the subject more broadly; but I do not think that any criticism of the Committee should be made by any member or by the Meeting, because its scope has been limited in its assignment, as I understand it——

THE PRESIDENT.—It certainly was.

MR. PHILLIPS.—I hope that the members, in voting on it, will consider whether it is the wish of the Society to broaden the scope of the Committee, and I hope the Committee will consider that if the Society votes for Mr. Metcalf's motion, that it will not be a reflection on the Committee.

THE PRESIDENT.—The motion is on the amendment made by Mr. Metcalf, to the effect that the result of enlarging both the membership and the scope of the Committee be referred to the Board of Di-

rection. Gentlemen, you have heard the motion. Those in favor say "aye"; contrary, "no".

The motion is carried, and it is so ordered.

This amendment takes the place of the original motion.

Report of Committee on A National Water Law.

The next is the Report of the Special Committee on A National Water Law. Is Mr. Newell here?

MR. WILLIAMS.—At the request of Mr. Newell, I beg leave to present this report. I shall not attempt to read the entire contents, but will select such portions as will call to your attention its principal features.*

THE PRESIDENT.—It has been suggested, in view of the fact that the hour is getting late, and that all the other Progress Reports have been printed in the December *Proceedings,* that they are before you, and that no report will be called up, unless some member present wishes to have it called up for discussion.

Reports of Committees on Columns and on Floods.

Therefore, the Progress Report of the Special Committee on Steel Columns and Struts;† the Progress Report of the Special Committee on Floods and Flood Prevention;‡ the Report of the Special Committee on Concrete and Reinforced Concrete, are before you.

Report of Committee on Concrete and Reinforced Concrete.

I beg pardon; I went too far. I call for the Report of the Special Committee on Concrete and Reinforced Concrete; I thought that had been printed; I was wrong. Is Mr. Worcester here?

Mr. J. R. Worcester presented a Progress Report of the Special Committee on Concrete and Reinforced Concrete to the effect that the Committee has in preparation its Final Report and expects to present it to the Society prior to July 1st, 1916.

THE PRESIDENT.—The report is accepted.

Report of Committee on Engineering Education.

I call for the Report of the Special Committee on Engineering Education, Mr. Desmond FitzGerald, Chairman.

DESMOND FITZGERALD, PAST-PRESIDENT, AM. SOC. C. E.—Mr. President and Gentlemen: I must say that I came here with a great deal of reluctance to-day, to make a Progress Report on Engineering Education; since the action of the Society that has preceded me, I feel, for one, prouder than ever of this Society, and I feel more willing to state that the Committee on Engineering Education, while it has made progress during the past year, is not ready yet to make a final report; and I believe that you will accept my statement in good faith.

Now, the evident shortness of time does not permit us to go into this question more comprehensively, and I think it is better not to do so unless it is desired; but I wish to state that it is my belief that

* See *Proceedings,* Am. Soc. C. E., for December, 1915, pages 2747 to 2751 of Papers and Discussions.

† See *Proceedings,* Am. Soc. C. E., for December, 1915, pages 2753 to 2769 of Papers and Discussions.

‡ See *Proceedings,* Am. Soc. C. E., for December, 1915, pages 2771 to 2787 of Papers and Discussions.

Report of Committee on Engineering Education (continued).

the Carnegie Foundation, which is now making a careful investigation in connection with our Committee, has made, within the last few months, an important advance in the solution of this wide-reaching question.

In view of the limited time, Mr. President, now at hand, I suggest that we postpone this statement for another year.

I have asked Professor C. R. Mann to come here, and he is prepared to tell you something about this advance; but we wish more time to discuss it and to investigate it in the Committee.

THE PRESIDENT.—Do you think that Professor Mann would be willing to make a short statement before the members of the Society? Professor Mann, would you care to do so?

MR. FITZGERALD.—It gives me a great deal of pleasure, Mr. President, to present Professor Mann, and he will make a five-minute statement, so that the Society may be thinking over this very point, and, if possible, aid in the solution, for it really means, on all these important questions before the Society, that many minds—not one or half a dozen—that many minds will, in the end, bring this matter to a successful issue.

C. R. MANN, ESQ.—Mr. Chairman and Members of the Society: The discussion of the Report of the Committee on Roads and Pavements has been very interesting. If this Committee has been unable after six years of work to submit satisfactory specifications as to how to build so simple a thing as an ordinary highway, is it reasonable to expect the Committee on Education to submit after seven years of work satisfactory specifications as to how to build so intricate a thing as the royal road to learning?

The progress to which Mr. FitzGerald has referred consists in having arrived at a definite formulation of the main problem. Education is an engineering project; and as you all know from experience, the chief difficulty in any project is the precise definition of the problem. Once you have secured an accurate statement of exactly what you propose to do, the doing of it is a relatively easy matter.

Many suggestions have been made to the Committee concerning the needs of engineering schools: as that they be made more vocational and less specialized, that the courses be broadened and simplified, that more English and economics be introduced. The value of these suggestions may be very different for different schools. They therefore do not define the general problem, but rather tend to focus the attention on a line of discussion that leads to no clear and definite statement of the real problem and to no important and far-reaching conclusion.

The real nature of the problem may be discovered by considering the actual condition of the schools from the point of view of organization, of curricula, and of methods of teaching. In the matter of or-

ganization the schools differ widely. At one extreme stands the school of the autocratic or military type where the director issues instructions to the professors and the professors direct the instructors, and the instructors command the students. Half way down the series come the schools in which the arts college ideal of academic freedom and departmental autonomy are maintained intact. In these each department is deeply impressed with the importance of its own subject and its own methods of teaching, but finds little occasion for real co-operation with other departments in designing the organization that will be best for the students. At the other extreme stands the school where the faculty co-operates closely and in a thoroughly democratic way in deciding, not only the general type of organization, but the details of the curriculum and the methods of instruction. How can any one decide which of these three types is best adapted to the development of an engineer unless he has a pretty definite notion of what an engineer really is?

The situation is the same when you come to study the various types of curricula. At one extreme we find schools in which the student studies thirteen subjects at one time; at the other are schools in which the student studies only three subjects at one time. Which curriculum is most likely to develop the best engineer, and how can you answer this question unless you have a very definite notion of what the essential characteristics of an engineer really are?

When you go into the details of teaching a given subject, you will find that in some schools chemistry, for instance, is taught in a highly theoretical way, beginning with the general principles and leading to specific applications. In other schools you will find chemistry taught on the basis of problems—practical experiences and practical questions concerning processes actually in use in the world's work. These problems are taken up, analyzed, and the chemical principles involved in them discovered. Which is the best way of teaching chemistry in order to produce the best and most effective engineer?

These are not questions which can be answered *a priori,* although they are frequently so answered in the schools. These questions can only be answered satisfactorily in the way you are answering your engineering problems satisfactorily. First, by determining a satisfactory working hypothesis as to what you are trying to do, and what results you expect to get; and, secondly, by deciding upon methods of measurements and tests by which your results can be measured and tested.

In the schools, we have at present no well-defined standard by which it might be possible to determine which is the best conceivable course; nor have we any adequate means of testing the results of a given course. So that the work of the Committee is now directed toward the determination of these two fundamental necessities. Before we can

Report of Committee on Engineering Education (continued).

analyze the course, and can say this course is probably better than that one, we have to have some kind of a statement as to what it is we are trying to produce. What is an engineer? What qualities are fundamentally important? And, in the second place, we have to have means of measuring our results.

Now, the first of these necessities can only be secured with the help of you gentlemen who are now in the practice of engineering, and who, therefore, understand what the engineer must be. For that reason, the Committee sent last spring a letter to the members of the Engineering Societies, asking, among other questions, What do you consider the fundamental characteristic necessary to success in engineering?

We received in reply to that letter, 1 500 answers from engineers all over the world; we have analyzed those 1 500 answers, and have a tentative definition of what are the characteristics essential for engineering.

This definition tells us that the most important thing for an engineer is "Character", which includes integrity, responsibility, resourcefulness, and initiative. These words were mentioned by more than two-thirds of the letters, and the number of times that they were mentioned give a weight to that item of 41 per cent.

The second in importance is a group of qualities called "Judgment", which includes common sense, scientific attitude, and perspective of life. That has a weight, according to the answers, of 17½ per cent.

The third group on the list is called "Efficiency", which includes thoroughness, accuracy, industry.

The fourth group is called "The understanding of men", including executive ability.

The fifth group is called "Knowledge of the fundamentals of engineering science", and the weight of that is 7 per cent. The last is called the "Technique of practice and of business", and its weight is 6 per cent.

If you combine these six groups into two general groups, then the personal qualities, character, judgment, efficiency, and understanding of men, have a weight of 87%, and the knowledge of fundamentals and of the technique of practice has a weight of 13 per cent.

If this is the correct definition of an engineer, the schools must reorganize very fundamentally. Very little conscious attention is there being paid to those qualities on which 87% of the success of the engineer depends. These personal qualities are usually regarded as a sort of by-product. I do not say that the school does nothing to develop character or resourcefulness, nor that it pays no attention to them. I do say that the development of these important personal

qualities is not in the focus of attention of the school. Their attention is focused on the last two items, which have a weight of 13 per cent.

Every one of you, when you employ a young engineer, size him up on the basis of qualities of this sort. You always give first weight to some particular quality, and second weight to some other quality. We are going to ask you to number those groups in their order of importance as you actually use them, when you try to size up young men for your employ, or for promotion, or when you try to judge of the reasons for the success or failure of your colleagues.

If a large number of engineers will do this, so that it becomes evident that the definition is correct, we shall have a working hypothesis or a measuring stick with which to attack the educational problem. It will then be possible to make progress which will be definite, and also to decide such questions as whether teaching chemistry from the theoretical point of view is better than teaching chemistry from the practical point of view.

If you engineers will give the schools a clear definition of what the engineer is, the schoolmen will know how to use it in strengthening the school. We thus ask you engineers simply to tell us what the product should be, and not how the schools should be conducted to secure that product. If you will define the product for the schools, the schoolmen will prove competent to produce it.

THE PRESIDENT.—The members of the Society, I am sure, feel under great obligations for having an opportunity of hearing this interesting statement of the work so far accomplished by the Carnegie Foundation, of which Professor Mann is in charge. I thank you very much, Professor Mann.

Report of Committee on Floods and Flood Prevention.

I have been asked by Col. Townsend, to state that the report which is marked and printed "Progress Report of Special Committee on Floods and Flood Prevention", is the final report. I wish to make that correction.

I now call for the Report of the Special Committee "On Valuation of Public Utilities". Is Mr. Stearns here, or Mr. Metcalf?

Report of Committee on Valuation.

MR. METCALF.—In the absence of Mr. Stearns, I submit the report:

"JANUARY 1, 1916.

"TO THE BOARD OF DIRECTION,
AMERICAN SOCIETY OF CIVIL ENGINEERS,
220 West 57th St., New York City.

"*Gentlemen:* Your Committee on the Valuation of Public Utilities presents herewith its report of progress made during the year 1915.

"The general plan, heretofore adopted, has been continued—that of carrying on, addressed in manifold to all of the members of the Committee, a written discussion upon the drafts of chapters assigned to and prepared by different members of the Committee, and of meeting from time to time for conference and discussion upon the general principles involved in valuation, which should be covered in the report.

Report of Committee on Valuation (continued).

Under this plan a voluminous correspondence has been carried on and the following meetings have been held during the year:

"9. April 8-10, 1915, at New York, three days, full attendance;
10. July 6-9, 1915, at Boston, four days, six members present;
11. October 11-14, 1915, at New York, four days, five members present;
12. December 27, 1915-January 1, 1916, at New York, six days, full attendance upon two days and six members present upon four days.

"To date there have been prepared, subject to possible final revision and modification, chapters upon the following subjects: introduction—discussing the activities and aims of the Committee and the purposes of valuation—glossary, fundamental principles of valuation, property to be included in physical valuation, original-cost-to-date, reproduction cost, depreciation and appreciation, development expense, non-physical values.

"The Committee hopes to be able to conclude in time for publication during the year 1916, perhaps within a six-months period, a report upon the method of applying the more important yard-sticks used in the valuation of public utilities.

"The expenses of the Committee during the past year have amounted to the sum of $419.34, as appears in the report of the Treasurer of the Society. The Committee asks for an appropriation of five hundred dollars ($500), in addition to the balance ($380.66) remaining from the appropriation for the year 1915, for the estimated expenses of the Committee for the year 1916.

"Respectfully submitted for the Committee,

"LEONARD METCALF,
"Secretary."

Discussion on Committee on Floods and Flood Prevention.

MR. OCKERSON.—I move, Mr. President, that the Report of the Special Committee on Floods and Flood Prevention be received, and that the Committee be discharged.

MR. WILLIAMS.—I second the motion.

THE PRESIDENT.—You recommend to the Board of Direction that the Committee be discharged.

MORRIS KNOWLES, M. AM. SOC. C. E.—The hour is late, and I will not take up much of your time; but it seems to me that, in view of the fact that the membership has noticed that this was a Progress Report, and that in a preliminary report it was stated that the Committee hoped to co-operate with the Special Committee on A National Water Law, and as the latter Committee has indicated in its progress report that there are many steps in which the matter of constructive regulation should be considered, it seems to me to be quite proper that this step should be extensively discussed; but, without going into any further discussion on the matter, I think the Committee should be continued for the purpose of joining with the Special Committee on A National Water Law, as was originally intended, and I so move.

(Motion duly seconded.)

THE PRESIDENT.—Mr. Ockerson, will you withdraw your motion in that case?

MR. OCKERSON.—I withdraw it.

THE PRESIDENT.—I will put the motion that the Committee be continued. Gentlemen, you have heard the motion. Those in favor say "aye"; contrary, "no". Carried.

THE SECRETARY.—I have here a discussion of the work of the Committee on Floods and Flood Prevention, which I ask for leave to print.

THE PRESIDENT.—If there is no objection, it is so ordered.

MR. FITZGERALD.—There is one item of interest that I forgot to mention in the report of Engineering Education: The total expense to the Society for the last three years has been absolutely nothing.

THE PRESIDENT.—A motion that the Committee be continued at the same expense is in order.

Report of Committee on Status of Engineers.

I call for the Report of the Special Committee on the Conditions of Employment and Compensation of Civil Engineers. Is Mr. Lewis here?

THE SECRETARY.—I know that that Committee is not ready to report at the present time. Mr. Lewis told me that he expected, within the next month or two, to have a complete report, which would be published in time for discussion at the Annual Convention next June.

Report of Committee on Soils.

THE PRESIDENT.—We will receive that as a progress report. I call for the progress report of the Special Committee appointed to Codify Present Practice on the Bearing Value of Soils for Foundations, *et cetera,* Mr. Robert A. Cummings, Chairman.

ROBERT A. CUMMINGS, M. AM. SOC. C. E.—The question of time is involved in what I have to say, and also the fact that I have nearly forty pages here, but as it will be printed later, I will merely submit it.*

Report of Committee on Railroad Track.

THE PRESIDENT.—The progress report is accepted. The Report of the Special Committee on Stresses in Railroad Track. A. N. Talbot, Chairman.

Mr. Talbot presented the following Progress Report:

"The Special Committee on Stresses in Track presents the following report of progress:

"It will be recalled that the Committee of the Society and the Committee of the American Railway Engineering Association are co-operating in the work on stresses in railroad track.

"The Joint Committee has held three meetings during the year. At the meeting in Chicago March 16th, 1915, eighteen members being present, the results of the preliminary tests made on track were considered, the conduct of experimental work for the season was discussed, and a general outline of tests was agreed upon as the plan of work for the season. At the meeting held in Champaign-Urbana, June 8th, 1915, seventeen members being present, field tests of the track of the

* This Report will be published in the March, 1916, *Proceedings.*

Report of Committee on Railroad Track (continued).

Illinois Central Railroad north of Champaign were inspected, including static tests and speed tests with locomotive and load dynamometer tests. The programme considered at the last meeting was discussed, and the points upon which it was thought emphasis should be placed were considered and a general programme approved. It was decided to confine the tests of the season to one location. At the meeting in New York, January 18th, 1916, eight members being present, a general discussion of the results of the tests was had.

"The experimental work has made satisfactory progress during the year. A considerable amount of effort has been expended on the development of instruments and methods of conducting the tests. It was apparent in advance that the problem was so complicated, the conditions so variable, and the difficulties so great that satisfactory instruments for determining stresses could be obtained only after long and patient trials. Especially in the case of the instrument for measuring strains in the rail under moving loads were difficulties found, and it was only late in the season, after repeated trials and changes, that the instruments for measuring strains in the rail under rapidly moving loads were put into acceptable form. It was believed to be important that these instruments should make a continuous record of the action of the rail under and between the wheel loads of the moving load. It was found essential that the stresses on both sides of the rail be measured simultaneously. A method of finding the depression of the track under moving load by photographic methods has been developed. The measurement of stresses under static loads was not found to be difficult, although the time consumed in this test is considerable.

"The field tests have been conducted on the main line of the Illinois Central Railroad north of Champaign. Only the general character of these tests can be outlined in this progress report. Data were taken to determine: (1) the distribution of stresses and moments along the rails for a given loading; (2) the division of vertical load among adjacent ties for a given loading; (3) the distribution of vertical pressures among the ties, through the ballast, and over the roadbed; (4) the depression, compressibility, or stiffness of the track; (5) the effect of wheel spacing of some types of locomotives, and also the effect of single and double concentrated loads; (6) the effect of speed upon most of the foregoing items. Tests have been conducted at speeds as high as 65 miles per hour. Among the variables of the track were three weights of rail, two sizes of ties, and three depths of ballast. In addition to tests on standard track, minor tests have been made at spots where uneven tie spacing, or worn or decayed ties, may affect the stresses developed. The Illinois Central Railroad Company has provided the locomotive and crew. The calculation and compilation of the results has proved to require a great deal of time. The data are now being put into shape, and it is expected the results will be ready soon for the consideration of the Committee. The results appear to give fairly definite quantitative values for stresses in the rails and for the general distribution of loads and pressure under the various conditions of the test. The Committee believes that it will be able to determine the general action of the track under moving loads. It is the purpose of the Committee to report to the Society at an early day the results of the tests already carried out.

"The Committee plans to continue the tests during the coming season, to complete the matters already partly covered, and to extend the experiments to include other features like action on curves and on track of different kinds.

"Respectfully submitted.

"A. N. TALBOT,
"Chairman."

THE PRESIDENT.—Is there any new business to come before the meeting?

Resolution on Mobilization, etc., of the Resources of the Country.

R. S. BUCK, M. AM. SOC. C. E.—Mr. President, I beg leave to offer for the consideration and action of this Meeting, certain resolutions for which it seems to me, the opportunity seems most fit.

Strenuous efforts are being made just now, chiefly at Washington, to inaugurate progress in naval development commensurate with the compelling needs of National safety, and this Society, as well as the other societies, has been participating very effectively in a professional and technical way.

This matter seems to rest largely on what the sovereign silent people want, or at least, want to an extent that will help, and on this crucial point there seems to be much doubt.

Libraries have been written on this subject in the press, in the magazines, and in every form of volume, covering every range of fact, alleged fact, thought, or imagination.

"Whereas: We believe that the United States has definitely adopted the following policies:

"To sustain the Monroe Doctrine;

"To retain, subject solely to its own will, guardianship, or control over all territories it now holds;

"To protect the rights of its citizens to freedom of travel and traffic on the high seas; and

"To protect the rights of all people within its borders in the pursuit of legitimate business; and

"Whereas: We believe that these policies are logical, just, wise, and beneficent, not only to the people of the United States, but to all peoples of the World, and are without purpose of territorial expansion or unfair quest of commercial advantage; and

"Whereas: The far-reaching, unprecedented, and terrible events of the last two years have indefinitely deferred the hope of establishing and maintaining the rights of nations and peoples by means of peaceful justice alone, and have forced the conviction that, as yet, no nation can safely maintain its rights, however firmly rooted in justice, without the aid of effectively developed physical force; and

"Whereas: The United States, by reason of sincere but erring faith in the advent of universal domination of peaceful policies has not maintained its Army and Navy establishments on a basis to meet the severe test of a great war, which has so long appeared a remote and receding possibility, but which is now an imminent and overwhelming reality; and

Resolution on Mobilization, etc. (continued).

"Whereas: Every dictate of dignity, reason, patriotism, and self-preservation demands that these establishments be placed as promptly and firmly as possible on a basis of strength and efficiency which will enable them to cope adequately with the enormous, exacting, and relentless task which, in support of our national policies, they may at any moment have to perform; and

"Whereas: Civil Engineering has, through its great range of experience in handling men and materials in all parts of the world and under all possible conditions, furnished the fullest demonstration of the fact that knowledge and skill derived from continuous effort and years of arduous training are essential to the successful performance of all great tasks, be they Civil or Military;

"Therefore, be it Resolved: That it is the sense of this Annual Meeting of the American Society of Civil Engineers that our national policies, both at home and abroad, imperatively demand, not only extensive, well-planned, and effectively and promptly executed enlargements of our Army and Navy establishments, but also a thorough and efficient plan of mobilization of those ponderous industrial and transportation resources of the country which are essential to the creation and operation of these establishments; and be it further

"Resolved: That it is the sense of this meeting that the adequacy of the Army and Navy establishments for properly supporting our national policies, as adopted by superior Civil Authority, should be determined by the Army and Navy experts who have devoted their careers to dealing with the vast and intricate problems involved, and who, both by reason of their technical knowledge and experience, and by further reason of their integrity, loyalty, patriotism, and ability, should commend the fullest measure of confidence at the hands of the Government and of the Public; and be it further

"Resolved: That it is the sense of this meeting that, although complete subordination of all branches of the Army and Navy to superior Civil Authority must at all times be maintained, such Civil Authority owes to itself, to the Army and Navy, and above all to the people whom it in turn serves, effective recognition of the superior claims of the findings of trained and tried experts as against party politics, sectionalism, insincere appeals for economy, transient expediency, private interests, and in fact against all other considerations than those of broad, sound, and just national policy; and be it further

"Resolved: That a copy of these resolutions be sent to the National Security Congress to convene to-morrow at Washington, through the Chairman of the Committee on Engineer Reserve, and that copies be mailed to the President of the United States, to the members of his Cabinet, and to the members of both Houses of Congress."

Discussion on Resolution on Mobilization, etc.

MR. FITZGERALD.—Mr. President, Fellow-Members of the Society: While there is a great deal both in these preambles, which have been read to us, and in the resolutions themselves, which undoubtedly awaken in our hearts a sympathetic response, I believe that they have been put in a very imperfect form.

I do not think that the majority of the members of this Society are willing to concede for a moment that the American people, as a

people, have been so low in their aims and desires as to put money before character. I do not think we wish this to go abroad as our view of American life. Then the resolutions are singularly lacking in simplicity. It is almost impossible to know for what we are really to vote; and I move, therefore, Mr. President, without further remarks, that they be referred to the Board of Direction.

(Motion duly seconded.)

F. W. SKINNER, M. AM. SOC. C. E.—Mr. President, I do not question the resolutions, which I think are somewhat long and involved, and I am not quite sure as to their meaning, but I would like to say one or two words regarding the importance of preparedness for this country. I have just returned from a five months' trip abroad. Much of that time I spent in the war zone. Some of the teachings of this war, as they affect the United States, have touched me most forcibly. The first is, that in this great conflict, which has already cost perhaps five or six million lives, the engineering operations and engineering progress have been the great factor. Hundreds of thousands of troops have been massed and thrown forward to their destruction, and have been destroyed by the superior engineering resistance that was offered, beginning, if you like, with the wonderful railroad system, which has enabled the Kaiser's hordes to be moved from side to side with such rapidity that they seemed almost to be simultaneously in opposite places, and then following with the developments of the submarines and aerial warfare.

It seems that nothing rests on its former plane, and that almost all the great elements of change in warfare are due to the wonderful engineering plans and advances which have been made with aeroplanes, going 11 000 ft. per min.; with other aeroplanes that have armored cabins, carrying eight men, four large guns, and two small ones, and other plans in proportion; with Zeppelins which weigh 20 tons, and have proved to be engines of tremendous dynamic force; with submarines that have effected results which we have seen and which in their turn are controlled by plans prepared by engineers against them; with submerged mines that have to-day reached such a state of perfection that in water of unknown depth they can be casually thrown overboard and permanently anchored in position an exact number of feet below the surface; with range-finders, which, without exposing the observers, give the exact range for miles; with artillery so arranged that it can be massed on one point and then have a range of 15 or 20 or even 24 miles; it shows the importance of the engineer, and the right which this body has to take aggressive steps towards preparedness.

The necessity for preparedness I think is easily manifested by the great facility with which any of the armed nations now in conflict could reach the United States. We have earned, to say the very least, dissatisfaction in foreign countries. Our policy has been neither

Discussion on Resolution on Mobilization, etc. (continued).

for nor against, and it has been very distasteful to some of our neighbors and some of our friends. Possibly, then, at the end of this conflict——

THE PRESIDENT.—May I call the attention of the speaker to the fact that time is pressing; that I feel most of us are in entire sympathy with the spirit of the resolutions submitted, and if he will cut his remarks short, I think he will get the attention of the members now present.

MR. SKINNER.—It seems to me that this body of engineers, more than any other body of engineers in this country, is entitled to take active measures to assist our country in preparedness, and that one of the great measures and dangers to which we might become easily exposed, and which it lies with engineers to foresee and combat—it is my personal experience after five months of war—on one occasion there came within a block of my lodging, a Zeppelin which passed over twenty miles of the congested districts of London and which, I believe, must have caused at least one thousand deaths——

A MEMBER.—May I ask what is the motion before the meeting?

THE PRESIDENT.—The motion before the meeting is that the resolutions which were presented be submitted to the Board of Direction for editing, if the Members of the Society see fit to adopt them.

R. W. HUNT, M. AM. SOC. C. E.—Mr. President, I must oppose that motion as it is stated. It happens that this Congress convenes to-morrow, and will be in session three days. It is my fortune to be a delegate to it from Chicago, from our home organization. Mr. Parsons, as I understand it, comes from New York, and I think that our hands, if Mr. Parsons will permit me, will be strengthened by a vote and a recommendation and the statement of this great organization.

We are for our country, or we are against it, and now is the time to speak. With all deference to the Board, unless it acts to-day, the force of that action, let it be ever so emphatic, will be lost. I would, therefore, move an amendment to that, sir, that these resolutions, as presented by Mr. Buck, be submitted to the Board of Direction with instructions that it will edit them to its best judgment and give them to Mr. Parsons to-night, so that he can use them to-morrow.

MR. WILLIAMS.—I question the language of the resolutions which are offered, though I am in sympathy with their purport. I do not believe that it is competent for this meeting to instruct the Board of Direction. I think that it can request the Board of Direction, and I think the Board of Direction will be likely to accede to its request, according to its best judgment. I therefore suggest that the word "instruct" be changed to "request".

MR. R. W. HUNT.—I have been obeying orders all my life, and I may have made a mistake in the language.

THE PRESIDENT.—Gentlemen, you have heard the motion which is submitted as an amendment, as I understand, to the original motion.

MR. FITZGERALD.—Yes; I would like to have my original motion clearly understood. It was that this matter be referred to the Board of Direction to take such action as seems desirable.

Now, if it is desired by this meeting that this action should be taken at once, why it is easy enough to add that to the request as the sense of this meeting that the Board of Direction should take such action. It has, however, been my experience through life that where we proceed too rapidly in a matter of this kind, we are very apt to make mistakes.

Certainly, this is an important and a vital step, and we who love our country and wish to see it properly protected, do not want to make mistakes. We want to have preparedness properly considered, and I think that is really at the bottom of this gentleman's own motion —at the bottom of his own idea. He has made his preamble for the resolutions to stand on, like the foundation of a monument, without considering the nature of the resolutions, and I think the resolutions themselves are cumbersome and lack simplicity, as I said before, and, therefore, are not practicable enough. No one wants to read such long resolutions, to begin with.

Now, my idea was to refer this to the Board of Direction, just as we refer everything else, not demanding that the Board take action to-day or to-morrow, but if it is the sense of this meeting by a subsequent motion that it is desirable that that action should be taken to-day, why, pass a resolution and tell the Board of Direction so. Then that leaves it unfettered; it has the matter in hand, at any rate.

But, if it is the desire of this meeting to-day that this question, that these resolutions be properly edited, and that they demand attention, then the Board of Direction knows that that is the sense of the meeting.

MR. WILLIAMS.—You will excuse me for speaking again. It occurs to me that possibly the movers of both resolutions might be willing to accept a substitute, namely, that this meeting declares its approval of the general sense and purport of the resolutions submitted, and requests that the Board of Direction consider to-day the preparation of suitable resolutions to be transmitted to the meeting of the American Security Congress through its Committee on Military Preparedness.

CLEMENS HERSCHEL, VICE-PRESIDENT, AM. SOC. C. E.—Mr. President, I do not believe in putting down democracy in the government of this Society. I do not know why this large meeting of members of the Society cannot instruct the Board of Direction. I am a member of the Board of Direction, and I welcome instruction of that sort from a body like this.

Discussion on Resolution on Mobilization, etc. (continued).

THE PRESIDENT.—Are you willing to accept the suggestion made?

MR. R. W. HUNT.—Yes, sir, I am.

THE PRESIDENT.—Will you accept that amendment that has been made by Mr. Williams?

MR. FITZGERALD.—No, sir; I think my original motion was a clear and simple one, that the matter be referred to the Board of Direction. Now, then, if we want it taken to-day, let us pass a vote that it is the sense of this meeting to-day that that action should be taken to-day.

THE PRESIDENT.—I would suggest that the motion be divided into two parts, that we first take a vote on the matter of referring it to the Board of Direction, and then we take a vote on the question of an immediate report on it by the Board of Direction.

MR. WILLIAMS.—I will offer my resolution as an amendment—as a substitute amendment—to Mr. FitzGerald's motion.

(Motion duly seconded.)

THE PRESIDENT.—That being the case, the motion is on the substitute amendment to Mr. FitzGerald's amendment. Will Mr. Williams state it clearly?

MR. WILLIAMS.—The substitute is that this meeting declare its sympathy and general approval of the principles set forth in the resolution as offered by Mr. Buck, and that the Board of Direction be requested to consider to-day and prepare a suitable expression of those ideas, to be transmitted to the American Security Congress to-morrow, through the Committee of this Society on National Preparedness.

MR. HERSCHEL.—I move to amend by changing the word "request" to "instruct".

THE PRESIDENT.—Do you accept that, Mr. Williams?

MR. WILLIAMS.—I accept that.

THE PRESIDENT.—Mr. Williams is no longer a member of the Board of Direction, so he is willing to have his former colleagues directed. The motion is then on the substitute offered by Mr. Williams. Those in favor of the substitute signify by saying "aye"; opposed, by the same signal.

The motion is carried.

MR. FITZGERALD.—May I suggest that that is a little awkward: Those in favor of the motion to signify by saying "aye"; those opposed, by the similar signal. I think it is not quite understood.

THE PRESIDENT.—I will put the motion again, to satisfy Mr. FitzGerald. Those in favor of the substitute as moved by Mr. Williams will please say "aye"; those opposed to the motion signify by saying "no".

The motion is carried; the substitute amendment takes the place of the original motion.

I will now put the original motion as amended. Those in favor of the original motion as amended will signify by saying "aye"; those opposed by saying "no".

The substitute amendment to the original motion is carried.

Is there any other new business? If not, the Secretary, I think, has some announcements.

Announcements.

THE SECRETARY.—There are very few. In order to get the matter on record, I have to report and will read the names, if the meeting desires, of those who have been elected by the Board of Direction since the last meeting of the Society: 6 Members, 67 Associate Members, and 21 Juniors have been elected, 21 Associate Members have been transferred to the grade of Member, and 20 Juniors have been transferred to the grade of Associate Member.* The names are here.

Elections.

THE PRESIDENT.—They will be printed. There is no reason for taking up the time of the members by reading them.

THE SECRETARY.—I have to announce the following deaths:

Deaths.

WILLIAM W. FOLLETT, of El Paso, Tex., elected Member, July 5th, 1893; died December 30th, 1915.

CHARLES CONRAD SCHNEIDER, of Philadelphia, Pa., elected Member, February 6th, 1884; Director, 1887; 1898-1900; Vice-President, 1902-1903; President, 1905; died January 8th, 1916.

JAMES KNAPP WILKES, of New Rochelle, N. Y., elected Associate Member, June 3d, 1891; Member, April 3d, 1906; died January 9th, 1916.

DAVID WILLIAMS, of St. Johnsbury, Vt., elected Member, May 4th, 1898; died November 27th, 1915.

LOREN EDWARD HUNT, of San Francisco, Cal., elected Associate Member, June 3d, 1903; died January 9th, 1916.

LUDLOW VICTOR CLARK, of Philadelphia, Pa., elected Associate, October 4th, 1892; died December 28th, 1915.

Annual Convention of 1916.

THE SECRETARY.—I have also to announce that the Board of Direction has decided that the next Annual Convention of the Society is to be held in Pittsburgh, Pa., during the last week in June. The dates are from 27th to 30th, inclusive; and that a local committee of arrangements has been already appointed, consisting of Messrs. George S. Davison, J. A. Atwood, R. A. Cummings, Richard Khuen, Morris Knowles, D. W. McNaugher, Emil Swensson, E. B. Taylor, W. G. Wilkins, and Paul Wolfel.

Programme.

THE SECRETARY.—I do not think, Mr. President, there is any special necessity of saying anything about the programme of the Annual Meeting; every one has it, and the details are there. It has been suggested by a gentleman who knows about the temperatures up at the Kensico Dam site, that those who go on the excursion to-morrow wear arctics or warm rubbers.

* The names of those elected and transferred are printed on pages 70 to 73 of this number of *Proceedings*.

THE PRESIDENT.—The next thing in order——

MR. FITZGERALD.—I should like to give notice that Boston is going to make an effort to have the Convention during the following year. I want you all to bear that in mind.

FRANCIS LEE STUART, M. AM. SOC. C. E.—Mr. President, as a Member and ex-Director of the Society, who is not on any committee, I know I voice to you a very large proportion of the Society's approval, and their intense interest in your committee work, and, referring to the report by Mr. Williams, I hope—and I know I voice the sentiment of the members of the Society—that the Board of Direction will use every financial resource they have to keep the work going on.

Ballot for Officers.

THE PRESIDENT.—The next thing in order is the report of the Tellers.

The Secretary read the Report of the Tellers, as follows:

"220 West 57th St.
New York, N. Y.
JANUARY 19TH, 1916.

"TO THE SIXTY-THIRD ANNUAL MEETING
"AMERICAN SOCIETY OF CIVIL ENGINEERS:

"The Tellers appointed to canvass the ballots for Officers of the Society for 1916 report as follows:

"Total number of ballots received		1 894
Ballots without signatures	36	
" stamped, not signed	5	
" from members in arrears of dues	12	
Total number not entitled to vote		53
Ballots canvassed		1 841
Defective	2	
"For President:		
E. L. CORTHELL		1 822
Scattering		11
"For Vice-Presidents:		
ALFRED CRAVEN		1 806
PALMER C. RICKETTS		1 809
Scattering		18
"For Treasurer:		
LINCOLN BUSH		1 832
Scattering		2
"For Directors:		
"District No. 1. VIRGIL G. BOGUE		1 780
"District No. 1. ALEXANDER C. HUMPHREYS		1 779
"District No. 1. Scattering		17
"District No. 2. OTIS F. CLAPP		1 772
"District No. 2. Scattering		8
"District No. 4. RICHARD KHUEN		1 774
"District No. 4. Scattering		5

"District No. 5. { F. G. JONAH..... 1 772
Scattering..... 15

"District No. 7. { EDWIN DURYEA, JR..... 1 763
Scattering..... 16

"JAS. F. SANBORN,
"LEWIS E. ASHBAUGH,
"DAVID R. COOPER,
"J. H. GRANBERY,
"J. DANIELS RICHARDSON,
"Tellers."

THE SECRETARY.—Before an announcement is made, I suggest that a vote of thanks be given to the Tellers for their work. They came here last night and worked for several hours, and I think it was a very nice thing for them to do.

T. KENNARD THOMSON, M. AM. SOC. C. E.—I so move.

(Motion duly seconded and carried.)

Officers Elected.

THE PRESIDENT.—In accordance with the report submitted, I hereby declare Mr. E. L. Corthell elected President for the ensuing year, and as Vice-Presidents, Messrs. Alfred Craven and Palmer C. Ricketts; as Treasurer, Mr. Lincoln Bush; as Directors, Messrs. Virgil G. Bogue, Alexander C. Humphreys, Richard Khuen, O. F. Clapp, Edwin Duryea, Jr., and F. G. Jonah.

The time has now come when I must step out of office. Fortunately, I have held it for so short a time that it is not difficult to let go. A year ago, when I appeared before you, I said that I would try to devote my entire strength to the best interests of this Society, and in furthering the interests of the Society. I counted on, and had to rely very largely on, the hearty co-operation of the members of the Board of Direction.

I can certify to you that the work of the Society has been carried on steadily during the past year, and that I have been heartily supported, in everything I have tried to do, by the members of the Board.

I tender to them—to those who remain and to those who are going out—my sincere thanks for the manner in which they have tried to aid me in what I wanted to do.

To you, in turn, I tender my sincere thanks for the honor you conferred upon me. As I said before, I hate to step down, but when a man steps down for a better man, nothing better can be done.

I have the very great pleasure in introducing to you as your new President, Mr. Elmer L. Corthell, who really needs no introduction to you. I know of no man to whom the interests of the Engineering Profession have been more at heart. He has labored in season and out of season for the recognition of the engineer in all walks of life.

Such recognition has come to him, and I would ask Past-President Hunter McDonald, to bring our new President to the chair.

(Mr. McDonald conducted Mr. Corthell to the chair.)

Remarks by President Corthell.

ELMER L. CORTHELL, PRESIDENT, AM. SOC. C. E.—It is rather late in life, but I am ready for it. After 21 years passed in foreign countries, South America and Europe, I am back again in my own country—after spending 16 of the 21 years elsewhere, largely engaged, almost altogether, in engineering professional work connected with International Societies, navigation and road congresses, *et cetera,* in Brazil, Argentine, Mexico, and elsewhere; and while I know very few men here, comparatively speaking, on account of long absences during perhaps a quarter of a century, I am willing to undertake to do the best I can during the next year. I know what I have to do. I know some of the things that are to be done. I have been told that I have a job on hand, several of them. I can name those now in which I am personally interested, and in which I approve what I know to be the sentiments of this Society, one of which is to decide upon the Nationalism of all the engineers of the United States. That is going on. It has practically been done. I understand it was done yesterday. So that now it rests upon you, and upon me, when the vote comes, to attend to our duty.

In the next case, we have grown to be eight thousand, I am told, rather a large body to be handled by an archaic constitution; and that is another matter coming up, in which we will need the good judgment, the attention, and interest of all the membership of this Society.

There is another matter, to my mind an important one. I refer to the relations between the National Societies (some as large as we are, and doing just the kind of work that we are doing, important engineering work for the benefit of the public at large), and the local societies that are also doing their work. Look at Philadelphia. In a wild campaign which they had a few days ago, they doubled up their membership; and Chicago, Boston, New Orleans, and St. Louis are doing their work by themselves. Many of their members are members of this Society, but they have their interests in their own localities.

The tendency all the time is to work together, and this we ought to encourage; and during the next year work out that problem.

Now, these are engineering professional domestic problems.

There are other great problems; and one great domestic problem has been brought forward to-day. It is not my intention to go into the subject. You have given a task to the Board of Direction for this afternon, which is quite important. I want to state that, about a year ago, I myself brought forward a resolution on a National Reserve Corps of Civilian Engineers, and was immediately sat upon, but the subject was referred to a Committee of the American Institute of Consulting Engineers; and in a few days I became its President; my motion had been for the President of the Institute to appoint a Committee on the subject; and I appointed a good strong Committee,

and that Committee took up the matter, and, later, came along the Committees of the other societies.

I had personally been elected a Chairman of a certain meeting, and I felt that I had some duties upon me personally, and for many months I conducted with the Secretary of War, and with the War College, all the matters relating to the subject of a National reserve corps of civilian engineers. Then there was a Committee appointed, a Joint Committee of all the societies; and then, on my suggestion, the Chairmen of those five Committees were selected and authorized by their various societies to act as an Executive Committee, to carry the matter forward; and when that was done, I wrote to the Secretary of War that he should thereafter communicate with the Chairman of those Chairmen, and that was Mr. Parsons, who has since been hard at work moving the matter forward.

I was in Washington last month on a very important Congress, the Second Pan-American Scientific Congress, and I know what Mr. Parsons has been doing.

Now, this matter is something that the new Board of Direction must take up this afternoon, and must bring it to a point where we can present a proper resolution to the National Security Congress being held to-morrow and the next day in Washington.

There is another subject, and I am going to make a report now. It will take me about five minutes, a report about a Congress in which I represented this Society on the Committee; and further than that, was appointed by the Secretary of State as the Secretary of Section 5, Engineering, of the Second Pan-American Scientific Congress, on which, by the way, I had been working for months, and I went to Washington ten days before the Congress met, in order to help General Bixby, the Chairman of Section 5, to prepare for it.

Now, I am not going into the details here, but I want to say to the members of this Society that that Congress has placed upon you a duty. That duty is to do cordially and fully what our Latin-American engineers of twenty-one republics want us to do, and that is to assist them in various ways looking to the general usefulness of the Engineering Profession in the whole Western Hemisphere.

At the last meeting—the final meeting of that Congress—there were passed certain resolutions, of which Section 5 had seven or eight, looking to the very work you are doing, only of an International scope; for instance, the laws of water, covering that whole subject, to be investigated by an International Committee.

Another was the uniform gauge for railways in the Western Hemisphere. Another was a standardization of specifications and tests of materials. Another was for a uniform or a proper nomenclature of engineering and scientific terms now different in Latin America and

Remarks by President Corthell (continued).

the United States; and I might mention several more, all of which are important.

Now, the result is this, that the countries are going to work to select the members of International Committees, which are going to handle these great engineering questions for the Western Hemisphere; and this Society will be called upon to do much work in connection with it, and it will be of immense advantage, not only to the United States, but to other countries.

This question of education, which we are studying now, is a very important one, and is of very great importance to Latin America. They are sending their students here, and professors of the various universities and technical schools will bear me out in the statement that numbers are coming, many more than are here now. They spoke to me about it. They say: "We are sending our young men to your technical schools to be educated". How important it is that the Committee of this Society should soon decide upon the proper method of providing technical education to these young men coming to all these schools.

Now, I will not dwell on this subject any longer. It is a sort of quasi report that I am making to the Society.

There is another thing that you will be interested to know, and that is that quite a number of the leading engineers, not only those who were at the Congress from Argentine, from Colombia, and other countries, but many more in those countries who were unable to come, desire to join the American Society of Civil Engineers, and have asked me to send the necessary documents to their homes, so that they can present their applications to this Society. Some of them I know personally are men of very high standing as engineers.

So this Congress has accomplished a great deal in the way of developing engineering in all the twenty-one republics of the Western Hemisphere.

Now, there is one great subject I just want to allude to, and that is the internationalism, not only of Pan-America, but also of the world. It just makes our hearts bleed to know that, although three years ago, or less time than that, we thought that our great international organizations, like the Navigation Congress and the Road Congress, and the Railway Congress, were all moving forward to accomplish great things for humanity. Now, look at us. It is enough to make one weep to see the hostility, the acrimonious feeling and everything that is hard, that has broken us up; and here we are, isolated in our own country, doing our own work all right, and satisfactorily, but abroad they are hating each other.

It is only three years ago, when at Quebec, the International Navigation Congress was about to disband, when I myself was called upon to make some remarks, and I brought forward the idea that the meeting

of engineers in that great International Congress and Association, was doing more for the peace of the world, than all else that could be done, and yet there is no peace.

Now, the time is coming along when this war is going to be over. It will not last forever; and it will be for us, on this side of the water, who have tried to keep ourselves in peace and in neutrality with all the nations, to help heal the wounds and bring them together.

Now, I want to relate one incident, and President Marx will probably remember it, to show that while this hatred exists between the Nations, I do believe, when you get right down to the bottom of things, the engineers are still friends. I will tell you why.

In 1898, at the Navigation Congress held in Brussels, there was an excursion to Antwerp; and we were taken on board a steamer to examine the navigation and report conditions at that city. We were at war with Spain, and there was to be a very prominent Spanish engineer on that trip; and the question was—I had heard it spoken of—how were these two men—Churruca and Corthell—to meet, with their countries at war? Without making any demonstration, when we saw each other, we fell into each other's arms, and patted each other on the back in true Spanish style, and all about us said "That shows the fraternity that exists among engineers for each other, no matter from what country they come, and no matter whether those countries are at war or not".

Now, when this war is over, there is a task for us, to try to bring together men in these great international organizations of engineers, the engineers of the whole world, no matter what the situation has been.

Now, these are some of the things that I have in my mind for the coming year. I am not going to ask you to help me to carry them out—either domestic or foreign—I know you will help me, and I shall rely upon the rank and file, if I may call it so, of this great Society, as well as upon my associates in the Board of Direction.

THE SECRETARY.—The President asks me to announce that the meeting of the Board of Direction will be held in the room off the reading room on this floor, directly after the adjournment of this meeting. Lunch will be served to the Directors there, so that they need not try to get something to eat before they go there. We have to get this resolution in shape.

THE PRESIDENT.—I declare the meeting adjourned. Adjourned.

EXCURSIONS AND ENTERTAINMENTS AT THE SIXTY-THIRD ANNUAL MEETING

Wednesday, January 19th, 1916.—After the Business Meeting lunch for about 650 members was served at the Society House.

At 2.30 P. M., through the courtesy of the Public Service Commission for the First District, Alfred Craven, M. Am. Soc. C. E., Chief Engineer, and the Rapid Transit Subway Construction Company, Contractors, about 225 members made an inspection of a portion of the Lexington Avenue Subway from 38th to 53d Streets.

At the same time, through the courtesy of the Department of Docks and Ferries, R. A. C. Smith, Commissioner, and Charles W. Staniford, M. Am. Soc. C. E., Chief Engineer, and also the Holbrook, Cabot, and Rollins Corporation, Contractors, a party of about 150 members visited and inspected the new 1 000-ft. pier now being built at 46th Street and the North River.

At 9 P. M. there was a Reception, with dancing, at the Hotel Astor, at which the attendance was 571.

Thursday, January 20th, 1916.—The day was devoted to an excursion to the Kensico Dam, by invitation of the Contractors, H. S. Kerbaugh, Inc. The party, consisting of about 470, was conveyed to Valhalla, near the site of the dam, in a special train which left the Grand Central Station at 10.20 A. M.

It will be recalled that on January 16th, 1913,* the Society visited the Kensico Dam, which was then under construction, only 80% of the excavation having been completed, and representing only 22% of the main contract. On the present occasion, the members found the dam in use and practically completed. The contract, for the dam and some of the appurtenant works, was let in 1910, and required all work to be finished by February 14th, 1920. The progress has been so rapid, however, that the entire contract is expected to be completed in 1916, about 4 years ahead of the requirements.

After inspecting the dam, the party was entertained at luncheon as the guests of the Contractors.

The party left Valhalla at 3.25 P. M., and arrived at the Grand Central Station at 4.35 P. M.

In the evening, at the Society House, there was a lecture by Nathan C. Johnson, M. Am. Soc. M. E., with motion pictures, showing the manufacture and nature of concrete. This was followed by a social and informal smoker, at which the attendance was about 1 020.

The following list contains the names of 790 members of various grades who registered as being in attendance at the Annual Meeting. The list is incomplete, as some members failed to register, and it does

* *Proceedings*, Am. Soc. C. E., for February, 1913, p. 104.

not contain the names of any of the guests of the Society or of individual members. It is estimated that the total attendance was about 1 200.

Abbott, C. P..White Plains, N. Y.
Abbott, Hunley...New York City
Ackerman, J. W...Auburn, N. Y.
Addis, W. G.....Winthrop, Mass.
Aikenhead, J. R...Boonton, N. J.
Aims, W. I.....New York City
Alderson, A. B.,
West Hartford, Conn.
Alexander, H. J..New York City
Allen, C. M.....Worcester, Mass.
Allen, F. W....Mt. Vernon, N. Y.
Allen, Kenneth....New York City
Ammann, O. H.,
New Brighton, N. Y.
Andrews, Horace..Albany, N. Y.
Appleton, T. A....Beverly, Mass.
Armstrong, R. W..New York City
Ashbaugh, L. E..New York City
Ashmead, P. H....New York City
Atkinson, Asher,
New Brunswick, N. J.
Atwood, T. C..New Haven, Conn.
Austin, W. E.....New York City

Babcock, W. S....New York City
Baker, P. S.....Philadelphia, Pa.
Baldwin, A. S.....Chicago, Ill.
Baldwin, W. J....Brooklyn, N. Y.
Bamford, W. B....Belmar, N. J.
Banks, C. W....Mt. Kisco, N. Y.
Barnard, E. E....Lynchburg, Va.
Barnes, T. H.....New York City
Barney, P. C.....New York City
Barney, W. J.....New York City
Baum, George....Yonkers, N. Y.
Beaty, R. E.....New York City
Beebe, H. R.....Utica, N. Y.
Beekman, J. V., Jr..Boston, Mass.
Beggs, G. E.....Princeton, N. J.
Belcher, W. E....New York City
Belden, E. T.....Pittsfield, Mass.
Belknap, J. M..Manhasset, N. Y.
Belknap, R. E....New York City
Bellows, S. R.....New York City
Benson, Orville.Pequannock, N. J.
Bentley, J. C..Hackensack, N. J.
Berger, John.....New York City
Bettes, C. R.Far Rockaway, N. Y.
Betts, R. T.....New York City
Beugler, E. J.....New York City
Bevan, L. J.....Montclair, N. J.
Bilyeu, C. S.....New York City
Blackmore, G. G..New York City
Blair, Alexander...Summit, N. J.
Blair, C. M....New Haven, Conn.
Blakeslee, Clarence,
New Haven, Conn.
Blakeslee, H. L.New Haven, Conn.
Blanchard, A. H..New York City
Bleistein, B. J.....Astoria, N. Y.
Boardman, C. S....Buffalo, N. Y.
Boardman, W. H..Newark, N. J.
Boes, F. C.,
West New Brighton, N. Y.
Bogart, John.... New York City
Bogert, C. L.....New York City
Bogue, V. G..New Rochelle, N. Y.
Boniface, Arthur.Scarsdale, N. Y.
Bonnett, C. P.,
New Rochelle, N. Y.
Bontecou, Daniel,
Kansas City, Mo.
Booth, G. W.....New York City
Booz, H. C.....Ardmore, Pa.
Boucher, W. J....New York City
Bouton, H. R.....New York City
Boyd, R. W.....New York City
Brace, J. H.....New York City
Brackenridge, J. C.New York City
Bradley, F. E.....New York City
Bramwell, G. W...New York City
Braslow, Barnett..New York City

Breed, H. E.....Albany, N. Y.
Breitzke, C. F.....Boonton, N. J.
Brennan, J. G.....Albany, N. Y.
Brennan, J. L....New York City
Breuchaud, Jules..New York City
Breuchaud, J. R...New York City
Briggs, J. A.....New York City
Briggs, W. C....Brooklyn, N. Y.
Brooks, J. P.....Potsdam, N. Y.
Brown, N. F.....Pittsburgh, Pa.
Brown, R. H.....New York City
Brown, T. E.....New York City
Brush, W. W....Brooklyn, N. Y.
Bryan, C. W.New Rochelle, N. Y.
Bryson, Andrew.New Castle, Del.
Buel, A. W.....New York City
Buettner, O. G....New York City
Burdett, F. A.....New York City
Burpee, G. W.....New York City
Bush, E. W.....Hartford, Conn.
Bush, Lincoln.East Orange, N. J.
Bushell, A. W..Jersey City, N. J.

Cahill, W. J.....Chicago, Ill.
Campbell, C. C..Philadelphia, Pa.
Cantwell, H. H..Montclair, N. J.
Carey, E. G..White Plains, N. Y.
Carle, N. A.....Newark, N. J.
Carpenter, C. E...Yonkers, N. Y.
Carr, Albert..East Orange, N. J.
Case, G. O.....New York City
Case, J. F.....New York City
Chambers, R. H..Flushing, N. Y.
Chase, C. F..New Britain, Conn.
Christian, G. L...New York City
Church, E. C.....New York City
Churchill, C. S.....Roanoke, Va.
Clapp, O. F.....Providence, R. I.
Clark, A. E..White Plains, N. Y.
Clark, G. H.....New York City
Clarke, E. W..Pleasantville, N. Y.
Clarke, G. C.,
Richmond Hill, N. Y.
Clarke, St. John....Bogota, N. J.
Closson, E. S....Montclair, N. J.
Closson, W. G....Brooklyn, N. Y.
Codwise, E. B....Kingston, N. Y.
Codwise, H. R....Brooklyn, N. Y.
Cole, E. S.....Montclair, N. J.
Collins, T. E....Elizabeth, N. J.
Comber, S. X....New York City
Conard, W. R..Burlington, N. J.
Condron, T. L.....Chicago, Ill.
Conger, A. A.,
Shelburne Falls, Mass.
Conklin, C. D., Jr.,
Cheltenham, Pa.
Conlon, F. J....Brooklyn, N. Y.
Connell, W. H..Philadelphia, Pa.
Connelly, J. A....New York City
Connor, E. H.,
Leavenworth, Kans.
Constant, F. H..Princeton, N. J.
Cooley, M. E..Ann Arbor, Mich.
Coombs, R. D..Ridgewood, N. J.
Coombs, S. E....Yonkers, N. Y.
Coomer, R. M..Sioux City, Iowa
Cooper, D. R.....New York City
Corthell, Elmer L...New York City
Coyne, H. L.....New York City
Crandall, C. L.....Ithaca, N. Y.
Crane, A. S.....New York City
Craven, Alfred....Yonkers, N. Y.
Cresson, B. F., Jr.,
Jersey City, N. J.
Crocker, H. S.....Denver, Colo.
Crocker, J. R.....New York City
Crooks, C. H.....New York City
Crosby, W. W....Baltimore, Md.
Cuddeback, A. W..Paterson, N. J.
Culyer, T. C.,
Purdy Station, N. Y.
Cummings, R. A..Pittsburgh, Pa.
Curtis, C. E.....Ithaca, N. Y.
Curtis, F. S.....Boston, Mass.
Cushing, W. C....Pittsburgh, Pa.
Cutler, L. G....Waterbury, Conn.

Dakin, A. H., Jr..New York City
Datesman, G. E.Philadelphia, Pa.

Davies, J. V.....New York City
Davis, C. E.....Philadelphia, Pa.
Dean, A. W.....Boston, Mass.
Dean, Luther.....Taunton, Mass.
Desmond, T. C....New York City
Develin, R. G...Philadelphia, Pa.
Deyo, S. L. F.....New York City
Dibert, H. M.....Troy, N. Y.
Diebitsch, Emil....Nutley, N. J.
Dillenbeck, Clark,
Philadelphia, Pa.
Dixon, G. G.....Kent, Ohio
Dodge, S. D.....Mahwah, N. J.
Donham, B. C..Glen Ridge, N. J.
Doron, C. S.....Brooklyn, N. Y.
Dorrance, W. T....Boston, Mass.
Dougherty, R. E.,
White Plains, N. Y.
Doyen, G. E.....New York City
Drake, R. E.....Brooklyn, N. Y.
Drayton, Newbold,
Penns Grove, N. J.
Dunlop, S. C.....New York City
Durfee, J. J.....Brooklyn, N. Y.
Durham, H. W...New York City
Durham, Leicester,
Scarsdale, N. Y.
Duryea, Edwin, Jr.,
San Francisco, Cal.

Earle, Thomas.....Steelton, Pa.
Easterbrook, F. J.,
New Haven, Conn.
Eckersley, J. O...New York City
Eddy, H. P.....Boston, Mass.
Edmondson, R. S..New York City
Edwards, D. G.....Hollis, N. Y.
Edwards, J. H.....Passaic, N. J.
Ellett, Tazewell, Jr.,
Richmond, Va.
Elwell, C. C..New Haven, Conn.
Ely, C. B.....Harrisburg, Pa.
Ely, G. W., Jr....New York City
Emerson, K. B....New York City
Endemann, H. K..Jamaica, N. Y.
Endicott, M. T.Washington, D. C.
Ewing, W. W....Westfield, N. J.

Farley, M. M....New York City
Farnham, A. B...Pittsfield, Mass.
Farnham, Robert,
Philadelphia, Pa.
Farrington, H. P..New York City
Fellows, A. L.....Denver, Colo.
Ferguson, L. R..Philadelphia, Pa.
Fernandez, R. A..New York City
Ferris, F. E.....New York City
Ferry, C. A...New Haven, Conn.
Files, T. H..White Plains, N. Y.
Firth, E. W.....Jamaica, N. Y.
Fischer, Charles, Jr.,
New York City
Fisher, E. A....Rochester, N. Y.
Fisher, H. T....Scarsdale, N. Y.
Fitch, C. L.....New Orleans, La.
FitzGerald, Desmond,
Brookline, Mass.
Fletcher, Robert..Hanover, N. H.
Flinn, A. D.....New York City
Ford, W. H.....Philadelphia, Pa.
Forgie, James....New York City
Fort, E. J.....Brooklyn, N. Y.
Foss, F. E.....New York City
Foster, E. H.....New York City
Fowler, C. W....New York City
Fox, W. F.....New York City
Fraser, C. E.,
Westmount, Que., Canada
French, A. W...Worcester, Mass.
French, J. B.....New York City
Frost, G. S.....Brooklyn, N. Y.
Fuller, G. W.....New York City
Fuller, W. B.....New York City

Gailor, C. F.....New York City
Gardiner, F. W....New York City
Gardiner, J. B. W.New York City
Gardner, Warren..New York City
Garfield, C. A...Bronxville, N. Y.

Gartensteig, Charles, New York City
Gaston, L. P...Somerville, N. J.
Gerhard, N. P...Scarsdale, N. Y.
Giesting, F. A.East Orange, N. J.
Gifford, G. E.....New York City
Gildersleeve, A. C.New York City
Giles, Robert.....New York City
Gillen, W. J.....New York City
Gilman, Charles..Plainfield, N. J.
Gilmore, T. N....New York City
Goldmark, Henry.New York City
Goldsborough, J. B., Croton-on-Hudson, N. Y.
Gons, L. R.....Brooklyn, N. Y.
Goodman, Benjamin, New York City
Goodman, Charles.New York City
Goodsell, D. B...Brooklyn, N. Y.
Gould, C. M.....New York City
Govern, E. J.....New York City
Granbery, J. H...New York City
Greathead, J. F., White Plains, N. Y.
Green, B. L.....Cleveland, Ohio
Green, F. M.....Berkeley, Cal.
Greene, Carleton..New York City
Greene, G. S., Jr., South Orange, N. J.
Greene, R. N.....Darien, Conn.
Greenlaw, R. W..New York City
Greenman, R. S...Albany, N. Y.
Gregg, J. H. C...Brooklyn, N. Y.
Gregory, C. E...Mt. Kisco, N. Y.
Gregory, J. H....New York City
Greiner, J. E.....Baltimore, Md.
Griffith, W. F. R....Norfolk, Va.
Groat, B. F.....Pittsburgh, Pa.

Haines, E. G., Richmond Hill, N. Y.
Hale, H. M.....New York City
Hall, M. W.....New York City
Hallock, J. C.....Newark, N. J.
Halsey, W. H., Bridgehampton, N. Y.
Hamilton, E. P...New York City
Hammel, E. F....New York City
Hammel, V. F....New York City
Hammond, G. T..Brooklyn, N. Y.
Hanavan, W. L...New York City
Hanmer, H. J..Gloversville, N. Y.
Hansell, W. A.....Atlanta, Ga.
Harby, Isaac, Richmond Hill, N. Y.
Harding, H. S.....Hollis, N. Y.
Haring, Alexander, New York City
Harrington, J. L., Kansas City, Mo.
Harris, B. B.....New York City
Harte, C. R...New Haven, Conn.
Harwood, G. A..Scarsdale, N. Y.
Haskell, E. E.....Ithaca, N. Y.
Haskins, W. J....New York City
Hatch, F. N.....New York City
Hatt, W. K.....Lafayette, Ind.
Hauck, William...New York City
Havens, W. W....New York City
Hawley, J. B..Fort Worth, Tex.
Hayden, E. C.....Boston, Mass.
Hayes, R. B.....Lexington, Ky.
Hazen, J. V.....Hanover, N. H.
Healy, J. R.....New York City
Heilbronner, L. C....Utica, N. Y.
Heiser, A. B.....Brooklyn, N. Y.
Heller, J. W., South Orange, N. J.
Herschel, Clemens, New York City
Hewes, V. H.....New York City
Higgins, J. W., Roselle Park, N. J.
Hilton, J. C.....Brooklyn, N. Y.
Hirai, Kikumatsu..New York City
Hodgdon, B. A...New York City
Hodgdon, F. W..Arlington, Mass.
Hodge, H. W....New York City
Hogan, J. P.....Brooklyn, N. Y.

Holbrook, A. R...New York City
Holden, C. A....Hanover, N. H.
Holdredge, N. C..New York City
Holland, C. M...Brooklyn, N. Y.
Holtman, Robert, Jr.,
Elmhurst, N. Y.
Hone, A. C.....Rye, N. Y.
Honness, G. G....Ashokan, N. Y.
Hoover, A. P.....Paterson, N. J.
Horton, R. E.....Albany, N. Y.
Horton, Theodore..Albany, N. Y.
Hosmer, R. H....Harrisburg, Pa.
Houston, W. O....Jackson, Mich.
Hovey, O. E.....New York City
Howard, J. L.....Boston, Mass.
Howard, L. T.....New York City
Howe, C. E.,
Hastings-on-Hudson, N. Y.
Howell, W. A.....Newark, N. J.
Howes, D. W....Brooklyn, N. Y.
Hoyt, J. C....Washington, D. C.
Hubbard, Prévost,
Washington, D. C.
Hudson, C. W.,
Upper Montclair, N. J.
Hudson, H. W....New York City
Hudson, O. A..San Antonio, Tex.
Huie, I. V. A.....New York City
Hulsart, C. R.....New York City
Hulse, S. C.....Bedford, Pa.
Humphrey, R. L.,
Philadelphia, Pa.
Humphreys, A. C...New York City
Hunt, A. M.....New York City
Hunt, C. E.....New York City
Hunt, Charles Warren,
New York City
Hunt, R. W.....Chicago, Ill.
Hurd, H. L..White Plains, N. Y.
Hurley, J. P....Brooklyn, N. Y.
Hutchins, Edward,
New York City
Hutchins, H. C..Brooklyn, N. Y.
Hyde, H. E.....Providence, R. I.

Immediato, Gerardo,
New York City

Jackson, J. F.New Haven, Conn.
Jacobsen, H. P. R.New York City
James, C. A.....Buffalo, N. Y.
James, R. L...Chapel Hill, N. C.
Jenkins, J. E.....New York City
Jennings, J. E...Brooklyn, N. Y.
Joachimson, Martin,
New York City
Johannesson, Sigvald,
Upper Montclair, N. J.
Jonah, F. G.....St. Louis, Mo.
Jonson, E. F.....New York City
Jordan, L. C.....Brooklyn, N. Y.
Joseph, Jacob....Brooklyn, N. Y.
Just, G. A.....New York City

Kane, I. P.....Gittings, Md.
Karner, W. J.....New York City
Kaufman, Gustave.New York City
Keefer, C. H. Ottawa, Ont., Canada
Keith, H. C.....New York City
Kelley, W. D.....Yonkers, N. Y.
Kellogg, R. C....Brooklyn, N. Y.
Kelly, C. W...New Haven, Conn.
Kelly, H. A....Jersey City, N. J.
Khuen, Richard..Pittsburgh, Pa.
Kilby, C. C....New Haven, Conn.
Kimball, F. C.....Summit, N. J.
King, E. T.....Arrochar, N. Y.
King, P. S.....Wilmington, Del.
Kinney, W. M.....Chicago, Ill.
Kinsey, W. A.....Newark, N. J.
Kirkwood, H. C..Flushing, N. Y.
Kittredge, G. W..Yonkers, N. Y.
Kittredge, H. C..Rochester, N. Y.
Knighton, J. A....New York City
Knowles, Morris..Pittsburgh, Pa.
Knox, S. B.....New York City
Koch, O. H. S....New York City
Kolb, H. J.....New York City
Koop, L. D.....New York City
Kornfeld, A. E....New York City

Krause, L. G...New Milford, Pa.
Krellwitz, D. W...New York City
Kuchar, F. M.....New York City

Lamson, W. M....New York City
Landers, C. S.....New York City
Landreth, O. H.,
Schenectady, N. Y.
Lange, T. F.....New York City
Langthorn, J. S...New York City
Lannan, L. E..Mt. Vernon, N. Y.
Larsson, C. G. E..Plainfield, N. J.
Latimer, C. A....New York City
Lavis, Fred.....New York City
Law, W. H.....Tiverton, R. I.
Lawrence, E. V...New York City
Lawrence, R. J..Philadelphia, Pa.
Leavitt, C. W....Hartsdale, N. Y.
Leffingwell, F. D.,
Upper Montclair, N. J.
Lehlbach, Gustav..Newark, N. J.
Lehman, H. M....Brooklyn, N. Y.
Leiser, Ferdinand, Jr.,
Brooklyn, N. Y.
Leland, O. M.....Ithaca, N. Y.
Leonard, H. R..Philadelphia, Pa.
Leser, Henry.....New York City
Lesley, R. W.....Haverford, Pa.
Lewis, L. H.....New York City
Lewis, N. P.....New York City
Lex, W. I.....Philadelphia, Pa.
Lindenthal, Gustav,
New York City
Litter, F. J.....New York City
Lobo, Carlos.....Brooklyn, N. Y.
Loewenstein, Jacob,
New York City
Logan, W. S.....Arlington, N. J.
Longley, F. F.....New York City
Look, M. J.Brown Station, N. Y.
Loomis, Horace,
Mt. Vernon, N. Y.
Loweth, C. F.....Chicago, Ill.
Lowinson, Oscar..New York City
Lucas, E. W. V. C.New York City
Lucas, G. L.....New York City
Lundie, John.....New York City
Lyon, G. J....Schenectady, N. Y.

MacCornack, C. W.,
Phœnixville, Pa.
MacFeeters, J. O.,
Glen Ridge, N. J.
MacGregor, R. A..New York City
Machen, H. B....New York City
Maclay, W. W.....Lee, Mass.
McCausland, C. P....Canton, Pa.
McConnell, I. W.,
Auburndale, Mass.
McCormack, E. W.,
Washington, D. C.
McDonald, Hunter,
Nashville, Tenn.
McDowell, F. F...New York City
McLure, N. R...Phœnixville, Pa.
McMinn, T. J....Brooklyn, N. Y.
McMullen, R. W.,
New Canaan, Conn.
McNab, William,
Montreal, Que., Canada
McNaugher, D. W.,
Pittsburgh, Pa.
McNulty, G. W...New York City
McPherson, R. H..New York City
Manley, L. B.,
West Roxbury, Mass.
Marburg, Edgar.Philadelphia, Pa.
Marsh, F. B....Crestwood, N. Y.
Marston, Anson.....Ames, Iowa
Martin, E. S.....New York City
Marx, C. D.....Palo Alto, Cal.
Mason, Francis...New York City
Masury, A. F.....New York City
Matlaw, I. S.....New York City
Mayell, A. J.....New York City
Mead, C. A.,
Upper Montclair, N. J.
Mead, D. W.....Madison, Wis.
Meadowcroft, William,
New York City

Meeker, R. A....Plainfield, N. J.
Meem, J. C.....Brooklyn, N. Y.
Megraw, W. A....Baltimore, Md.
Mehren, E. J.....New York City
Melius, L. L.....New York City
Menke, William..New York City
Mercer, C. H.....Steelton, Pa.
Meriwether, Coleman,
New York City
Merrill, R. H.....Albany, N. Y.
Merriman, Mansfield,
New York City
Merriman, R. M.,
Central Valley, N. Y.
Merryman, W. C..New York City
Metcalf, Leonard...Boston, Mass.
Miller, H. A.....Boston, Mass.
Miller, R. P.....New York City
Miller, S. F.South Orange, N. J.
Mitchell, S. P...Philadelphia, Pa.
Modjeski, Ralph...Portland, Ore.
Mogensen, O. E..Plainfield, N. J.
Moisseiff, L. S....New York City
Molitor, Frederic..New York City
Moncure, W. A.Philadelphia, Pa.
Monsarrat, C. N.,
Montreal, Que., Canada
Montfort, Richard.Louisville, Ky.
Moore, F. F....Hawthorne, N. Y.
Moore, W. H..New Haven, Conn.
Morrill, G. P..Bridgeport, Conn.
Morrison, H. J.Amsterdam, N. Y.
Morse, C. F..Good Ground, N. Y.
Morton, W. S.....New York City
Moss, W. B..Tompkinsville, N. Y.
Mozart, W. J....Westboro, Mass.
Muhs, F. R...San Francisco, Cal.
Muir, J. C.....Bloomfield, N. J.
Muirhead, J. H. H.New York City
Murray, J. F....Philadelphia, Pa.
Musson, E. F.....Norwich, N. Y.
Myers, C. H.....New York City
Myers, E. T. D., Jr.Richmond, Va.
Myers, J. H..White Plains, N. Y.

Nabstedt, A. T....Brooklyn, N. Y.
Najjar, S. A.....Brooklyn, N. Y.
Nelson, J. W....Brooklyn, N. Y.
Neuman, D. L....New York City
Neumeyer, R. E.,
South Bethlehem, Pa.
Noble, F. C.....Brooklyn, N. Y.
Norris, W. H.....Portland, Me.
Norsworthy, L. D.New York City
Northrop, A. A.,
White Plains, N. Y.
Norton, G. H.....Buffalo, N. Y.

O'Brien, J. H.....New York City
Ockerson, J. A....St. Louis, Mo.
Odell, F. S....Port Chester, N. Y.
O'Hara, M. J.....Hudson, N. Y.
Okeson, W. R.....Orange, N. J.
Olmsted, H. W.,
Pleasantville, N. Y.
Orr, Alexander.Gloversville, N. Y.
Ott, S. J.....Rutherford, N. J.
Owen, James....Montclair, N. J.

Paddock, H. C....Caldwell, N. J.
Pagon, W. W.....Baltimore, Md.
Paine, H. A....Wilmington, Del.
Palmer, S. B.....Norwich, Conn.
Parker, C. J.....New York City
Parker, J. L.....New York City
Parlin, R. W.....Brooklyn, N. Y.
Parmley, W. C.,
Upper Montclair, N. J.
Parsons, H. de B..New York City
Parsons, R. S.....New York City
Peck, L. F.....Hartford, Conn.
Pegram, G. H....New York City
Peirce, V. M..Washington, D. C.
Pellissier, G. E.,
Springfield, Mass.
Pelz, C. E.....New York City
Pemoff, J. J.....New York City
Perkins, W. W. C.Conneaut, Ohio
Perrine, George...New York City
Philips, J. H..Glen Ridge, N. J.

Phillips, A. E..Washington, D. C.
Pickersgill, W. C.Providence, R. I.
Pitkethly, D. L..Brooklyn, N. Y.
Pohl, C. A.....New York City
Pollock, C. D.....New York City
Pommerer, R. W.,
White Plains, N. Y.
Pond, F. H.....Brooklyn, N. Y.
Poole, C. A.....Rochester, N. Y.
Poore, H. C.....Braintree, Mass.
Porter, G. F.,
Montreal, Que., Canada
Porter, J. E.....Yonkers, N. Y.
Porter, J. M.....Easton, Pa.
Pratt, A. H..White Plains, N. Y.
Pratt, F. E....Glen Ridge, N. J.
Preston, H. W.....Elmira, N. Y.
Price, F. O.....Brooklyn, N. Y.
Price, P. L.....Hempstead, N. Y.
Prichard, H. S....Pittsburgh, Pa.
Priest, B. B..East Orange, N. J.
Proctor, R. F.....Baltimore, Md.
Prout, H. G.....Nutley, N. J.

Quimby, H. H..Philadelphia, Pa.
Quimby, J. H..Pearl River, N. Y.
Quincy, Edmund..New York City
Quinn, M. F.....New York City

Ralston, J. C.....Spokane, Wash.
Rankin, E. S.....Newark, N. J.
Reeves, W. F.....New York City
Reichmann, A. F....Chicago, Ill.
Rennell, H. H....New York City
Requardt, G. J....Baltimore, Md.
Reynolds, L. C.,
Rockville Center, N. Y.
Rice, G. S.....New York City
Richards, N. A....New York City
Richardson, J. D..Corona, N. Y.
Richardson, R. D...Scranton, Pa.
Richmond, J. P. W.,
New York City
Ridgway, Robert..New York City
Riedel, J. C.....Brooklyn, N. Y.
Riegler, L. J.....Ben Avon, Pa.
Rights, L. D.....New York City
Ripley, H. L.....Boston, Mass.
Ripley, Joseph.....Albany, N. Y.
Robbins, A. A....New York City
Robbins, D. W.....Utica, N. Y.
Robbins, F. H.,
White Plains, N. Y.
Roberts, R. F.....Nutley, N. J.
Robinson, E. F....New York City
Robinson, E. W...New York City
Robinson, G. L....New York City
Robinson, H. D...New York City
Rogers, A. W....Rochester, N. Y.
Rogers, E. H. West Newton, Mass.
Rogge, J. C. L....Katonah, N. Y.
Rothrock, W. P...New York City
Ruckes, J. J., Jr..New York City
Rumery, R. R.....New York City
Rust, H. P.....New York City
Ryan, M. H.....New York City

Sackett, R. L...State College, Pa.
Sacks, S. I.....Philadelphia, Pa.
Sanborn, F. B.,
Tufts College, Mass.
Sanborn, J. F.....Nutley, N. J.
Sanford, H. C.....New York City
Saville, C. M.....Hartford, Conn.
Sayers, E. L....Hackensack, N. J.
Schaeffer, Amos...New York City
Scheidenhelm, F. W.,
New York City
Schmidt, H. H...Brooklyn, N. Y.
Schneeweiss, A. E..Newark, N. J.
Schneider, E. J.,
San Francisco, Cal.
Schreiber, J. M....Newark, N. J.
Schwarze, C. T....New York City
Seabury, G. T..Providence, R. I.
Seage, C. E.New Brighton, N. Y.
Seaman, H. B....New York City
Searight, G. P....New York City
Searle, C. D.....New York City
Searle, L. F.....Kingston, N. Y.

Seaver, Clifford....Bayside, N. Y.
Selby, O. E.....Cincinnati, Ohio
Serber, D. C.....New York City
Shailer, R. A....Brookline, Mass.
Shaner, H. L.....Lynchburg, Va.
Shaughnessy, C. S.Brooklyn, N. Y.
Shaw, G. H....Washington, D. C.
Shedd, G. G...Manchester, N. H.
Shellenberger, L. R.,
Bayonne, N. J.
Sherman, H. J....Camden, N. J.
Sikes, Z. H.....Yonkers, N. Y.
Sitt, W. T.....New York City
Skillin, E. S....Glen Ridge, N. J.
Skinner, B. B....New York City
Skinner, F. W.,
Tompkinsville, N. Y.
Skinner, J. F....Rochester, N. Y.
Sloan, S. A.....Philadelphia, Pa.
Smith, Augustus..Bayonne, N. J.
Smith, C. E.,
West New Brighton, N. Y.
Smith, C. W....Westwood, N. J.
Smith, E. F.....Brooklyn, N. Y.
Smith, E. M.....Chicago, Ill.
Smith, E. N.....Nutley, N. J.
Smith, H. E..Binghamton, N. Y.
Smith, J. R.....Phœnixville, Pa.
Smith, J. W.....New York City
Smith, W. F.....Valhalla, N. Y.
Smoley, C. K.....Scranton, Pa.
Snow, J. B....Woodhaven, N. Y.
Snow, J. P.....Boston, Mass.
Snyder, G. D.....New York City
Soest, H. C.....New York City
Solomon, G. R.....Atlanta, Ga.
Soper, G. A.....New York City
Spear, P. H.,
Hastings-on-Hudson, N. Y.
Spear, W. E.....New York City
Spencer, C. B.....New York City
Spencer, Herbert..New York City
Splitstone, C. H.,
East Orange, N. J.
Spofford, C. M.....Boston, Mass.
Sprague, E. L., Jr.Valhalla, N. Y.
Staniford, C. W..Brooklyn, N. Y.
Stark, C. W.....New York City
Starr, H. H.....New York City
Stearns, F. LeRoy.New York City
Stearns, F. Lincoln,
Scarsdale, N. Y.
Stearns, R. H..Providence, R. I.
Stein, J. B.....Brooklyn, N. Y.
Steinman, D. B...New York City
Stern, E. W.....New York City
Stickle, H. W....Brooklyn, N. Y.
Stiles, A. I.....New York City
Stoddard, G. C...New York City
Stowitts, G. P....Yonkers, N. Y.
Strachan, Joseph.Brooklyn, N. Y.
Strong, M. R.....New York City
Stuart, F. L.....Baltimore, Md.
Sullivan, J. F....New York City
Sullivan, J. G.,
Winnipeg, Man., Canada
Sutton, C. W.....Yonkers, N. Y.
Sutton, Frank..Washington, D. C.
Swain, G. F.....Boston, Mass.
Swezey, E. C....Brooklyn, N. Y.
Swindells, J. S...Brooklyn, N. Y.

Taber, G. A.....Brooklyn, N. Y.
Taft, J. R.....New York City
Talbot, A. N.....Urbana, Ill.
Talbot, Earle....Englewood, N. J.
Talbot, K. H.....Pittsburgh, Pa.
Tallman, Leroy...Brooklyn, N. Y.
Tallman, P. B.,
East Orange, N. J.
Terry, A. H....Bridgeport, Conn.
Thomas, C. D....Brooklyn, N. Y.
Thomas, W. J....New York City
Thomes, E. H.....Jamaica, N. Y.
Thompson, S. C...New York City
Thompson, S. E.,
Newton Highlands, Mass.
Thomson, Alexander, Jr.,
Walden, N. Y.
Thomson, John...New York City

Thomson, S. F...Brooklyn, N. Y.
Thomson, T. K....New York City
Thomson, W. B..Cleveland, Ohio
Tidd, A. W..White Plains, N. Y.
Tillson, G. W....Brooklyn, N. Y.
Tompkins, E. De V.,
New York City
Tompson, G. M..Wakefield, Mass.
Townsend, C. McD.St. Louis, Mo.
Trautwine, J. C., Jr.,
Philadelphia, Pa.
Tretter, G. A.....Roanoke, Va.
Tribus, L. L.....New York City
Triest, W. G.....New York City
Trimpi, A. L..East Orange, N. J.
Trout, C. E.....New York City
Tucker, L. W....Freeport, N. Y.
Turneaure, F. E...Madison, Wis.
Turner, D. L.....New York City
Tuska, G. R.....New York City
Tuttle, A. S.....New York City
Tyson, A. H....Glen Ridge, N. J.

Ungrich, M. J.....New York City
Upton, Joseph....Flushing, N. Y.

Vail, E. M.....Plainfield, N. J.
Vallely, W. P.....New York City
Value, B. R.....New York City
Vandervoort, B. F.Brooklyn, N. Y.
Van Horne, J. G..New York City
Van Keuren, C. A.,
Jersey City, N. J.
Van Norden, E. M.,
Brooklyn, N. Y.
Van Suetendael, A. O.,
Albany, N. Y.
Van Winkle, E. B.New York City
Vaughan, L. B...Kingston, N. Y.
Vincent, J. I.....New York City
Vinton, T. M.....New York City
Vogel, J. L.....Jersey City, N. J.
Vroman, Guy...Larchmont, N. Y.

Wadsworth, J. E..New York City
Wagner, John, Jr.,
Phœnixville, Pa.
Wagner, S. T...Philadelphia, Pa.
Wahlman, Petrus.New York City
Wait, B. H..Poughkeepsie, N. Y.
Waite, D. C.....Brooklyn, N. Y.
Wallace, J. F.....New York City
Warnock, W. H..Edgemere, N. Y.
Watkins, F. W.,
White Plains, N. Y.
Watters, G. L.....Bethlehem, Pa.
Webster, A. L....New York City
Wegmann, Edward.Yonkers, N. Y.
Wells, C. E.....Yonkers, N. Y.
Wells, G. E....Naugatuck, Conn.
Wendt, E. F..Washington, D. C.
Werbin, I. V.....New York City
Weymouth, Aubrey,
Flushing, N. Y.
Wheatcroft, H. B., Jr.,
Newark, N. J.
Wheeler, W. S....New York City
Whiskeman, J. P.New York City
White, Lazarus...New York City
Whitman, A. B....Baltimore, Md.
Whitson, A. U....Flushing, N. Y.
Wickersham, J. H.Lancaster, Pa.
Wiggin, E. W..New Haven, Conn.
Wiggin, T. H....Scarsdale, N. Y.
Wilcock, Frederick,
Brooklyn, N. Y.
Wild, H. J.....Chester, Pa.
Wiley, W. H.....New York City
Wilkerson, T. J...Pittsburgh, Pa.
Williams, C. G...Plainfield, N. J.
Williams, G. D....Albany, N. Y.
Williams, G. S.Ann Arbor, Mich.
Williams, J. P. J.New York City
Williams, M. W....Albany, N. Y.
Williamson, S. B.New York City
Wilmot, James....New York City
Wilmot, Sydney..New York City
Wilson, P. H.....Devon, Pa.
Wilson, William..New York City

Wilson, W. L.....Bethlehem, Pa.
Wilson, W. T.....New York City
Winslow, F. I.....Boston, Mass.
Winsor, F. E...Providence, R. I.
Winsor, G. A.Pleasantville, N. Y.
Wise, C. R.....Passaic, N. J.
Witmer, F. P.East Orange, N. J.
Woehrlin, G. J..Brooklyn, N. Y.
Wolcott, C. S.....Hornell, N. Y.
Wolfe, F. C....Bridgeport, Conn.
Wolfe, F. G.....Scranton, Pa.
Wolff, H. H.....Seattle, Wash.
Wolff, R. B.....Glendale, N. Y.
Woodcock, H. W.Brooklyn, N. Y.
Worcester, J. R....Boston, Mass.
Wright, F. J.....Paterson, N. J.
Wulff, E. J.....Tarrytown, N. Y.
Wyckoff, C. R...Hartsdale, N. Y.
Wyman, A. M.,
Long Island City, N. Y.

Yappen, A.....Chicago, Ill.
Yates, W. H.....New York City
Yereance, A. W.,
South Orange, N. J.
Yereance, W. B.,
South Orange, N. J.
Young, C. G.....New York City

SOCIETY ITEMS OF INTEREST

Suggested Change of Society Headquarters

To the Corporate Members,

American Society of Civil Engineers:*

An offer has been made to this Society which your Board considers to be one, the acceptance or rejection of which is perhaps the most important question which has ever come before the Society.

It will be remembered that 12 years ago by a letter-ballot the Corporate Members of the Society decided not to accept, in its behalf, a quarter interest in the gift of Mr. Andrew Carnegie of $1 050 000 to be expended on a home for the four National Societies.

Subsequent to this decision Mr. Carnegie gave the amount mentioned to the three other Societies, and at No. 29 West 39th Street there was erected a thirteen-story building for their occupancy. This money was expended entirely upon the building, the three Founder Societies furnishing the land.

In 1896 this Society purchased two lots on West 57th Street and erected its own home, and, subsequent to the decision not to accept Mr. Carnegie's offer, purchased an additional lot and erected an addition to the original building thereon, so that the present home of the Society consists of a four-story and basement building of 75 ft. frontage, and an average depth of 110 ft. 7 in.

The advisability, even the necessity, of greater co-operation between the various branches of the Engineering Profession for the general good has been a frequent topic of discussion among individuals for the last few years. One of these discussions resulted in an informal meeting of a number of gentlemen interested in this subject on June 9th, 1915. At this conference there were present the President and Vice-President of the United Engineering Society, the President of the American Institute of Mining Engineers, the President-elect of the American Institute of Electrical Engineers, a Past-President of the American Society of Mechanical Engineers, and the Secretary of the American Society of Civil Engineers.

Following this conference correspondence between the President of the United Engineering Society and the President of the American Society of Civil Engineers led to the following communication:

"Dr. Charles D. Marx, *President,*
American Society of Civil Engineers,
220 W. 57th Street, New York.

"My Dear Sir:

"Referring to my letter of June 10th I have the honor to advise you that the following Resolution was unanimously passed by the

* This communication was issued February 1st, 1916, by the Board of Direction to all Corporate Members.

United Engineering Society at its meeting on June 24th and I was directed to lay it before you:

"'*Resolved,* That out of its desire to welcome the American Society of Civil Engineers into the fraternity of the Founder Societies and with a sense of the increased dignity and usefulness to the engineering profession which this adherence of the American Society of Civil Engineers would contribute, the United Engineering Society hereby desires to express the sentiment in favor of coalition which has been growing, and to invite the American Society of Civil Engineers to consider entering the United Engineering Society as an additional Founder Society; and the President is authorized to appoint a Committee to confer with any corresponding Committee of the American Society of Civil Engineers in the formation of a tentative plan which if this invitation is accepted can be referred on the part of the United Engineering Society to the governing bodies of the Founder Societies for their action.'

"In accordance with this Resolution I have appointed as the Conference Committee referred to Vice-President Charles F. Rand, Chairman, Dr. Alexander C. Humphreys and Mr. H. H. Barnes, Jr., and I am forwarding this letter in care of Dr. Hunt at the Headquarters of the American Society of Civil Engineers, sending a duplicate to your California address.

"Believe me, Dear Sir, with hope for favorable action on the part of the American Society of Civil Engineers,

"Very respectfully yours,

"GANO DUNN,
President."

In order that the membership may not be confused, it should be explained that the United Engineering Society was incorporated for the purpose of acting for the three Founder Societies, viz.: the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, in all matters relating to their property holdings, and that this original suggestion and the subsequent offer made by the United Engineering Society acting for these three Founder Societies have been confirmed by each of the Societies separately.

A Conference Committee as suggested in the above letter consisting of Vice-President Clemens Herschel, Past-Director Robert Ridgway, and Secretary Chas. Warren Hunt, was appointed by President Marx, and after careful investigation of the whole question, reported to your Board September 20th, 1915. At a meeting of the Board November 9th, 1915, the Committee was enlarged by the addition of Vice-President Charles F. Loweth and Past-Presidents John A. Ockerson, George F. Swain, and Hunter McDonald. This Committee has been going into the whole matter thoroughly, and has been furnished by the Committee

of the United Engineering Society with all available data upon which a judgment of the situation, so far as business arrangements are concerned, must be based. The present communication is based on the unanimous report of that Committee.

There have been two offers made which may be briefly stated as follows:

(A) That a two and one-half story addition be made to the United Engineering Society Building at a cost estimated at $225 000, and not to exceed $250 000. That the American Society of Civil Engineers shall pay for this addition if the cost does not exceed the latter figure, and if said cost does exceed $250 000, the additional expense shall be borne by the United Engineering Society.

That the American Society of Civil Engineers shall then become an equal owner in the whole enlarged property on the same terms as each of the three present Founder Societies, and occupy as much space as it may need on the two floors to be added.

(B) That the American Society of Civil Engineers become one of the Founder Societies by the payment into the United Engineering Society Treasury of a sum of money equal to that which each of the three Founder Societies has paid, the estimated amount being $240 000. This sum to be invested in interest-bearing bonds and held for the benefit of the United Engineering Society, of which the American Society of Civil Engineers would then become a part. That these bonds would be available in case it should later be found necessary to enlarge the building; otherwise, the income would be available for the activities of the United Engineering Society as the Founders may determine. The American Society of Civil Engineers to occupy such part of the sixth and seventh floors as it needs. (See Appendix B).

The property of the United Engineering Society now stands free and clear of all debt, and there is a Reserve Fund of $70 160.89 for amortization of the building and for depreciation and repairs, and if the first offer is accepted this Society will have an equal ownership in the entire enlarged property with the three other Societies for practically the same amount of cash which each of them has expended up to the present time.

It will be observed that if offer "A" is accepted the present building will be enlarged so as to accommodate in a large and up to date stackroom the proposed great Research Library in addition to providing enough additional space for the use of our Society on the two top floors, thus leaving plenty of room for the accommodation of other smaller scientific and technical organizations, many of which now occupy space in the building.

If offer "B" is accepted many of these present occupants will necessarily have to seek other quarters, and, as the work of the four Societies grows, eventually there will be room only for the four Founder Societies. It is true that the proposed addition may be made when necessary but in the meantime the building will have lost the character of a Headquarters for all professional activities, and will be only the home of the four Founder Societies.

It is evident, therefore, that the acceptance of offer "A" will carry out more fully the broad fundamental idea which underlies the whole proposal.

There can be no question as to the ability of the four Societies to handle the larger of the two propositions from the beginning.

In order to ascertain from a reliable source what quick assets the Society may have with which to operate, a valuation of the present property of the American Society of Civil Engineers was made by the Real Estate Board of New York, which report is as follows:

"A careful examination of the property having been made, the present value of land and improvements is appraised at three hundred and twenty-five thousand ($325 000) dollars.

Value of land	$290 000
Value of building	35 000
Total valuation	$325 000"

Annexed to this is the following statement:

"The building is a four-story and basement brick and stone building, about 20 years old built for the American Society of Civil Engineers. It is in excellent condition and is adaptable only for the use of a club or possibly a restaurant."

It will be noticed that in this report the present value of the ground on which the Society House is built is given as $290 000. Its total cost to the Society, including legal fees, etc., was $185 406.20. Attention is called to the fact that the cost of the building, including legal expenses, etc., has been $174 775.64, and that its estimated value by the Real Estate Board of New York is only $35 000. Adding the cost of the land to the cost of the building, the total cost of the Society's real property at the present time has been $360 181.84, and it is only proper to say that the present House of the Society is, in the opinion of many members, adequate for its present needs, and could not be duplicated at the present date at the figures given. In other words, that the Society could not at the present date duplicate its plant for less than $475 000.

Assuming, however, that the property could not be sold quickly at more than the amount named by the Real Estate Board, and adding the amount which the Society now has invested in bonds over and

above the amount of the present mortgage, it would appear that a very conservative estimate of the available assets which could promptly be turned into cash is $365 000. ($90 000 is now invested in bonds and the present mortgage indebtedness is $50 000.) Should therefore the Society accept offer "A" it could make full payment and have between $115 000 and $140 000 in the treasury, and would then own a one-quarter interest in the enlarged property of the United Engineering Society, the cost of which added to the accumulated reserve fund already mentioned will amount to $1 967 332; one-quarter of which is $491 833.

A careful investigation of the cost of operation and maintenance at the present home of the Society, and for an equal accommodation in the 39th Street Building, shows that this item need not be considered, there being no material difference in the annual cost of operation.

Your Board does not think it necessary to burden this Report with details of figures which have to be gone into with great care in order to arrive at correct results, but all of the statements of fact that are made in this Report may be relied upon as having been arrived at after the most careful and thorough investigation.

Your Board also wishes to suggest that, as there would be no great haste about selling the property of the Society, a sum considerably more than that estimated by the New York Real Estate Board may be secured.

The Libraries of the three Founder Societies, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, are now combined, and are being operated by the United Engineering Society, and the addition of the Library of the American Society of Civil Engineers would result in a collection of engineering books aggregating approximately 150 000 volumes which would form the nucleus for one of the greatest Technical Libraries of the world, which when properly housed, catalogued, and maintained, would furnish an equipment for the carrying on of research work which could not be excelled. There is reason to believe that should such a combination be formed, funds to a large amount would be forthcoming for the endowment and maintenance of such a Research Library.

For a number of years it has been quite evident to those who have been close to the activities of Engineering Societies that a closer co-operation is needed especially along the lines of the general welfare of the Profession. Matters have come up from time to time which have resulted in the appointment of a Joint Committee (which is now in existence) to consider and to report back to the Governing Bodies of each of the Societies on any question brought to its attention which affects the Profession as a whole, and Joint Committees of all the Societies have also done much work in matters relating to proposed

Legislation in various States on the Licensing or Registration of Engineers, and in connection with the work of the recent Constitutional Convention of the State of New York. In addition to this all four of these National Societies have been represented for more than nine years on the John Fritz Medal Board of Award, and they are now all equally represented on the Engineering Foundation Board, which was founded by the generous gift of Mr. Ambrose Swasey. It is largely through such joint committees made up of members of each Society, clothed with the proper authority, that the general welfare of the Engineering Profession can be safeguarded and promoted.

It is the belief of your Board, after repeated conferences with the officers and Conference Committee of the United Engineering Society, that such Committees, which now must be more or less disjointed in their action, may be made more permanent, and therefore represent more authoritatively the Engineering Profession in matters relating to the status of the Profession generally, and its individual members, both financially and socially, and in a manner which it is not possible for any one purely professional organization to accomplish. The need for such authoritative representation is clearly indicated by the attitude of many members of our Society, as well as of the other National Organizations.

The Engineering Profession needs co-operation along these lines, there being no coherence between individuals, or groups of individuals, and it is one of the purposes of this movement to strengthen the bonds of brotherhood which should exist between all Engineers.

It is fully recognized that to accomplish anything of magnitude sacrifices often must be made, and that to a certain extent, at least as far as property ownership is concerned, our Society, if the offer is accepted, will give up a certain amount of independence. This does not, however, go any further than the property consideration, as it is not proposed in any way to change the methods of control of each individual Society. Closer association with men of similar training, though working along the lines of different specialties, should tend to broaden the views of those who come within the sphere of such influence.

Our Society now has a fine home, adequate, in the opinion of many members, for its present needs, and, as they think, capable of such enlargement as may be rendered necessary during the next 15 or 20 years. On the other hand, if the proposed enlargement of the United Engineering Society Building is carried out, there will be plenty of room for the four Founder Societies, and for a large number of other organizations not strong enough to own their own headquarters, and thus there will be in the City of New York a representative American Engineering Headquarters where any Engineer may go with the certainty of meeting his professional brothers.

In such a project as this there are many details to be considered, and while much study has been given to the whole question by your Board, in its execution there will doubtless be many matters of adjustment which cannot be foreseen.

The main question, however, which must be decided by the membership of the Society is whether the offer of the United Engineering Society shall be accepted.

Your Board submits the following questions to letter-ballot of the Corporate Membership, without recommendation, believing that every member, after careful consideration of the matter presented in this report, should vote upon them as his individual judgment dictates.

These questions are:

First: Shall the American Society of Civil Engineers accept one of the offers made in behalf of the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, through the United Engineering Society?

Second: If the result of this ballot is in the affirmative,

(*a*) Do you favor Plan "A" as outlined?

(*b*) Do you favor Plan "B" as outlined?

(*c*) Do you favor leaving the question of the plan to be accepted in the hands of the Board of Direction?

Enclosed herewith is a Ballot on these questions, with two Envelopes. Ballots may be enclosed and sealed in the smaller, and mailed in the larger. To make the vote valid, however, the signature of the Corporate Member must be endorsed on the outer envelope. The Ballot must be returned on or before June 15th, 1916. The canvass will be conducted by the Board, and the result reported to the Business Meeting of the Annual Convention.

There will also be mailed to each member a pamphlet, kindly furnished by the United Engineering Society, descriptive of the building, joint ownership and occupancy of which is offered, as it stands to-day.

By order of the Board of Direction,

CHAS. WARREN HUNT,
Secretary.

NEW YORK, FEBRUARY 1ST, 1916.

Appended to this Report for the information of the membership are the following:

(A) Letter of August 23d, 1915, signed by Messrs. Charles F. Rand, H. H. Barnes, Jr., and Alex. C. Humphreys, referring to offer "A".

(B) Letter of October 28th, 1915, signed by Messrs. Charles F. Rand, H. H. Barnes, Jr., and Alex. C. Humphreys, referring to offer "B".

(C) Statement of cost of United Engineering Society Property.

(D) Statement of cost of the Property of the American Society of Civil Engineers.

APPENDIX

ACCOMPANYING REPORT OF BOARD ON PROPOSED CHANGE OF HEADQUARTERS OF AMERICAN SOCIETY OF CIVIL ENGINEERS DATED NOVEMBER 24th, 1915

(A)

29 West 39th Street,
NEW YORK, N. Y., August 23, 1915.

MR. CLEMENS HERSCHEL, *Chairman,*
MR. CHARLES WARREN HUNT,
MR. ROBERT RIDGWAY,
Special Committee of American Society of Civil Engineers.

Gentlemen:

On July 6th we submitted to you a memorandum relating to the project of arranging for the American Society of Civil Engineers to become a Founder Society of the United Engineering Society. At the time the memorandum was submitted, we had before us the estimates of architects and builders to the effect that the changes in the Engineers Building as contemplated would cost approximately $300 000. Since that time, after an opportunity for consultation with the officers of the various Societies, we have become aware that all proper requirements can be met by the expenditure of a somewhat smaller sum.

The original plan and estimate provided for the addition of three floors to the building, two for offices and one for library uses. Present plans contemplate two floors for offices and a mezzanine floor for library storage.

We now have estimates from architects and contractors indicating that the sum of $225 000 will be sufficient. To this, for safety, this committee considers it wise to add $25 000 for contingencies, making the total $250 000.

In our memorandum of July 6th, we suggested that whatever it costs to enlarge the building the Civil Engineers should pay.

We would now propose that if the cost is less than $250 000, the difference should inure to the benefit of the Civil Engineers. We would also propose that U. E. S. guarantee that the improvements, provided no radical change is made in present plans, shall not cost to exceed $250 000.

Upon the approval of this arrangement by the Civil Engineers, the original Founder societies would offer to share with the Civil Engineers the amount of the original Carnegie gift.

Hoping that the suggestions will meet with favor, we are

Very truly yours,

CHARLES F. RAND,
H. H. BARNES, JR.,
ALEX. C. HUMPHREYS.

(B)

NEW YORK, October 28, 1915.

MR. CLEMENS HERSCHEL, *Chairman,*
MR. CHARLES WARREN HUNT,
MR. ROBERT RIDGWAY,
Special Committee,
American Society of Civil Engineers.

GENTLEMEN:

Referring to our communications of July 6th and August 23rd, relating to the proposal that the American Society of Civil Engineers should become a Founder Society of the United Engineering Society, you will recall that one of the suggestions contained in our letter of July 6th was that the Civil Engineers and their library might be accommodated in the existing building for some considerable time without material change therein.

We desire again to refer to this suggestion, which in our opinion merits most careful consideration on the part of all concerned.

Many of the Trustees of the United Engineering Society, and, we think, some of the members of your Society who have considered the question are of the opinion that we should look forward to the time when the building would be used exclusively by the Civil Engineers, Mining Engineers, Mechanical Engineers and Electrical Engineers, and the Library, without any associate societies in the building. These societies of mining, electrical and mechanical engineers are at the present time very handsomely housed in the building on the ninth, tenth and eleventh floors thereof. The sixth, seventh and eighth floors are partially occupied by associate societies who could, if necessary, be gradually provided for in adjoining buildings. Some could be retained until such time as the four great societies require the entire building.

The Library has now assigned to it the twelfth and thirteenth floors, where we have ample space for upward of a quarter of a million volumes.

The combined libraries of the three old Founder Societies and the United Engineering Society now contains fifty-five thousand bound volumes, fifteen thousand unbound volumes and pamphlets, and five thousand specifications, maps, etc., total seventy-five thousand. We understand that the library of the Civil Engineers contains twenty-five thousand bound volumes, forty-eight thousand unbound volumes and pamphlets, and thirteen thousand specifications, maps, etc., total eighty-six thousand.

As there are many duplications which could be eliminated if and when the Civil Engineers join, it has been estimated that the number of books added might not exceed 10 000, and that there would still be space in the existing library quarters for from 100 000 to 150 000 accessions which would probably be sufficient for several years to come.

It is quite possible that we might find it desirable to provide for still further accessions to the Library and for enlarged activities thereof, in which event it would be possible, with the friendly co-operation of the Founders, that a rearrangement of the floors could be effected and free the eleventh floor so as to add that floor to the library.

In our opinion the sixth floor of the building is the most desirable of any, the ceilings being materially higher than any other office floor. This is because the floor was originally built and used for lecture rooms. It has now been divided for offices. This sixth floor and the

seventh floor, or so much thereof of both as necessary, might very well be used as the headquarters of the American Society of Civil Engineers.

In our opinion the present building has ample accommodations for the four Societies and the library, and for space for all to expand and we think it is possible that further conference may develop some economies of space, such, for example, as having only one or two Board rooms instead of four, and perhaps other similar arrangements which may indicate that the building is actually too big.

In case, therefore, you consider the foregoing suggestions, we would think that the following arrangement might be proper:

That the American Society of Civil Engineers if and when it becomes a Founder Society, should arrange to pay into the United Engineering Society treasury a sum of money equal to that which each of the three Founder Societies has paid. We estimate this sum at Two Hundred and Forty Thousand Dollars. This sum to be invested in interest-bearing bonds and held for the benefit of the United Engineering Society, of which the Civil Engineers would then be a part. These bonds would be available in case it should later be found necessary to enlarge the building; otherwise, the income would be available for the activities of the United Engineering Society as the Founders might determine.

May we suggest a careful examination of all parts of the existing building by the members of your committee, in order that its present facilities and possibilities may be clearly understood.

Very truly yours,

CHARLES F. RAND,
H. H. BARNES, JR.,
ALEX. C. HUMPHREYS.

(C)

COST OF THE THIRTEEN-STORY BUILDING OF THE UNITED ENGINEERING SOCIETY, 29 WEST 39TH STREET.

Original expenditure of the Building Committee	$1 060 039.85
Paid for the land	540 000.00
Paid brokers, and expenses obtaining land	24 000.00
Paid for additional elevator, storage facilities, toilets, etc., etc	23 131.31
Accumulated repair and depreciation fund	70 160.89
Total	$1 717 332.05

(D)

COST OF PROPERTY AND BUILDING OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS, 220 WEST FIFTY-SEVENTH STREET.

Lots	$185 406.20
Building	174 775.64
Total	$360 181.84

Report of Committee of the Board of Direction on the Licensing of Architects, Etc.

To the Board of Direction,
American Society of Civil Engineers.

Gentlemen.—Your Committee, appointed to consider and report upon the question of the Licensing of Architects, submits the following report:

The American Institute of Architects has a Standing Committee on Legislation, and most of the State Chapters of the Institute have similar Committees. Through these agencies there has been effected in several States laws regulating and licensing the practice of Architecture; and similar legislation has lately been actively proposed in several States, notably Iowa, Pennsylvania, Washington, Ohio, Wisconsin, Kentucky, Texas, Oregon, and Oklahoma.

All these laws, as also all those heretofore proposed, make illegal the construction of buildings, except upon the plans and specifications prepared by licensed architects. These laws define buildings so broadly and comprehensively as to include practically every enclosed structure; and under them only licensed architects could legally design even the simplest structures, including those generally designed by Engineers.

It is not generally conceded that the safety and welfare of the public are best safeguarded by the licensing of the several professions and crafts. But if such be the case, it can be so only when those licensed include all who by training and experience are qualified.

The Architectural License laws, now in force and proposed, work serious hardships upon Engineers. They cannot legally plan many structures for which they are at least as competent as Architects, and many others for which they may be more competent; even the minor and appurtenant building details incident to varied and extensive construction works of large magnitude are excluded.

The Architectural License law of Illinois, passed several years ago, and enforced of late with increased rigidity, resulted in placing the Engineers in that State engaged in structural designing in an intolerable position. With great difficulty they have lately secured legislation providing for the licensing of structural engineers, who are permitted to plan and supervise certain classes of buildings and structures in common with licensed architects. Their former handicap, while not entirely eliminated, is largely removed. There also results another cleavage line between Engineers, as there are now Structural Engineers and others, the law recognizing only the first named. Perhaps, in time, separate licenses may be required for Sanitary Engineers, Electrical Engineers, Municipal Engineers, etc., etc., none of whom, however, could legally design the small structures appurtenant to his particular line of work.

Immediately upon its appointment, your Committee corresponded with from two to six members of the American Society of Civil Engineers in some 20 States, in an endeavor to ascertain whether efforts were being made to further Architectural licensing legislation; it found that such was the case in 8 States at least, but in each instance without success. It is apparent, therefore, that the Engineering Profession is in danger of the spreading of the discrimination which now exists in some States, and which in no small measure still remains in Illinois.

It seems to your Committee, therefore, that some organized effort should be made by the Engineering Profession to prevent further legislation discriminating against Engineers similar to the Architectural License laws in Colorado, Illinois, and other States; and it recommends that the other National Engineering Societies be asked to co-operate with the American Society of Civil Engineers with a view to taking such action as upon further investigation may appear desirable. Also, that the Joint Committee thus formed invite the co-operation of the American Institute of Architects in an endeavor to find some plan which may further the mutual esteem and co-operation of the two professions.

Pending the results of the steps just recommended, your Committee further recommends that this matter be referred to the Local Associations of this Society in all those States in which the Legislatures will convene this year, requesting that they take organized action in opposition to the enactment of any legislation for the licensing of the practice of Architecture, which would in any degree hamper or restrict the legitimate and proper practice of Engineers.

In States where there may be no Local Association, it is recommended that a State Committee be appointed to perform the same function.

Respectfully submitted,

C. F. Loweth,
Gardner S. Williams,
Daniel Bontecou,
Committee.

The Board of Direction, on January 17th, 1916, adopted the recommendations of this Report.

Pan-American Engineering Committee

The Board of Direction, on January 17th, 1916, authorized the appointment of representatives of this Society to act jointly with similar committees of the three other National Engineering Societies, for the purpose of promoting a closer political, social, scientific, commercial, and industrial association throughout the Americas, and to be known as the Pan-American Engineering Committee.

The following members have been appointed: Fred Lavis, Chairman; Chandler Davis, B. F. Cresson, Jr., P. W. Henry, and Edgar Marburg.

Committee on Legislative and Constitutional Matters

The report of the representatives of this Society appointed in connection with the Constitutional Convention of the State of New York was presented to the Board of Direction at its meeting of November 9th, 1915, and has been printed in the *Proceedings*.* At its meeting of January 17th, 1916, the Board authorized the appointment of a Committee of three to act with similar committees of other Engineering Societies as a Conference Committee for the consideration of all similar Legislative and Constitutional matters which may arise in this or other States. Messrs. Arthur S. Tuttle, Henry W. Hodge, and Alfred D. Flinn, the original representatives of the Society in this matter, were reappointed as such Committee.

* December, 1915, p. 74.

ANNOUNCEMENTS

The House of the Society is open from 9 A. M. to 10 P. M., every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

FUTURE MEETINGS

March 1st, 1916.—8.30 P. M.—A regular business meeting will be held, and two papers will be presented for discussion, as follows: "A Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing", by Joseph W. Ellms, M. Am. Soc. C. E., and John S. Gettrust, Esq.; and "The Effects of Straining Structural Steel and Wrought Iron," by Henry S. Prichard, M. Am. Soc. C. E.

These papers were printed in *Proceedings* for January, 1916.

March 15th, 1916.—8.30 P. M.—At this meeting a paper by George Henry Ellis, M. Am. Soc. C. E., entitled "The Flow of Water in Irrigation Channels", will be presented for discussion.

This paper is printed in this number of *Proceedings.*

April 5th, 1916.—8.30 P. M.—This will be a regular business meeting. A paper by A. C. Janni, M. Am. Soc. C. E., entitled "Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports", will be presented for discussion.

This paper is printed in this number of *Proceedings.*

ANNUAL CONVENTION

The Forty-eighth Annual Convention of the Society will be held at Pittsburgh, Pa., from June 27th to 30th, 1916, inclusive.

Arrangements for the Convention are in the hands of the following Local Committee:

GEORGE S. DAVISON, *Chairman,*

J. A. ATWOOD,	D. W. MCNAUGHER,
R. A. CUMMINGS,	EMIL SWENSSON,
RICHARD KHUEN,	E. B. TAYLOR,
MORRIS KNOWLES,	W. G. WILKINS,

PAUL L. WOLFEL.

SEARCHES IN THE LIBRARY

In January, 1902, the Secretary was authorized to make searches in the Library, upon request, and to charge therefor the actual cost to the Society for the extra work required. Since that time many searches have been made, and bibliographies and other information on special subjects furnished.

The resulting satisfaction, to the members who have made use of the resources of the Society in this manner, has been expressed fre-

quently, and leaves little doubt that if it were generally known to the membership that such work would be undertaken, many would avail themselves of it.

The cost is trifling compared with the value of the time of an engineer who looks up such matters himself, and the work can be performed quite as well, and much more quickly, by persons familiar with the Library.

In asking that such work be undertaken, members should specify clearly the subject to be covered, and whether references to general books only are desired, or whether a complete bibliography, involving search through periodical literature, is desired.

It sometimes happens that references are found which are not readily accessible to the person for whom the search is made. In that case the material may be reproduced by photography, and this can be done for members at the cost of the work to the Society, which is small. This method is particularly useful when there are drawings or figures in the text, which would be very expensive to reproduce by hand.

PAPERS AND DISCUSSIONS

Members and others who take part in the oral discussions of the papers presented are urged to revise their remarks promptly. Written communications from those who cannot attend the meetings should be sent in at the earliest possible date after the issue of a paper in *Proceedings*.

All papers accepted by the Publication Committee are classified by the Committee with respect to their availability for discussion at meetings.

Papers which, from their general nature, appear to be of a character suitable for oral discussion, will be published as heretofore in *Proceedings*, and set down for presentation to a future meeting of the Society, and on these, oral discussions, as well as written communications, will be solicited.

All papers which do not come under this heading, that is to say, those which from their mathematical or technical nature, in the opinion of the Committee, are not adapted to oral discussion, will not be scheduled for presentation to any meeting. Such papers will be published in *Proceedings* in the same manner as those which are to be presented at meetings, but written discussions only will be requested for subsequent publication in *Proceedings* and with the paper in the volumes of *Transactions*.

The Board of Direction has adopted rules for the preparation and presentation of papers, which will be found on page 429 of the August, 1913, *Proceedings*.

LOCAL ASSOCIATIONS OF MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

San Francisco Association

The San Francisco Association of Members of the American Society of Civil Engineers holds regular bi-monthly meetings, with banquet, and weekly informal luncheons. The former are held at 6 P. M., at the Palace Hotel, on the third Friday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 P. M., every Wednesday, and the place of meeting may be ascertained by communicating with the Secretary of the Association, E. T. Thurston, 713 Mechanics' Institute, 57 Post Street.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in San Francisco, and any such member will be gladly welcomed as a guest.

Colorado Association

The meetings of the Colorado Association of Members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary, L. R. Hinman, 1400 West Colfax Ave., Denver, Colo. The meetings are usually preceded by an informal dinner. Members of the American Society of Civil Engineers will be welcomed at these meetings.

Weekly luncheons are held on Wednesdays, at 12.30 P. M., at Clarke's Restaurant, 1632 Champa Street.

Visiting members are urged to attend the meetings and luncheons.

(Abstract of Minutes of Meeting)

November 13th, 1915.—The meeting was called to order at the Denver Athletic Club; President John E. Field in the chair; L. R. Hinman, Secretary; and present, also, 19 members and 7 guests.

The minutes of the meeting of October 9th, 1915, were read and approved.

Mr. F. C. Steinhaur, Superintendent of Mountain Parks, City and County of Denver, addressed the meeting on "Construction of Automobile Highways in the Mountain Parks". The subject was generally discussed, and brief descriptions of the Estes Park-Grand Lake Highway and of the road to the summit of Pike's Peak, were given by Messrs. Fred C. Dreher and L. E. Bishop, respectively.

A vote of thanks was tendered Mr. Steinhaur for his address.

Adjourned.

Atlanta Association

The Atlanta Association of Members of the American Society of Civil Engineers was organized on March 14th, 1912. The Association holds its meetings at the University Club, Atlanta, Ga.

At the meeting of the Association on January 9th, 1915, the following officers were elected for the ensuing year: President, Park A.

Dallis; First Vice-President, B. M. Hall; Second Vice-President, P. H. Norcross; Secretary-Treasurer, T. B. Branch.

Baltimore Association

On May 6th, 1914, the Baltimore Association of Members of the American Society of Civil Engineers was organized, a Constitution adopted, and the following officers were elected: J. E. Greiner, President; Francis Lee Stuart, First Vice-President; L. H. Beach, Second Vice-President; Harry D. Williar, Jr., Secretary-Treasurer; and Messrs. H. D. Bush, B. T. Fendall, B. P. Harrison, Calvin W. Hendrick, Oscar F. Lackey, M. A. Long, and A. A. Thompson, Directors.

At its meeting of September 2d, 1914, the Board of Direction considered and approved the proposed Constitution of the Baltimore Association of Members of the American Society of Civil Engineers.

Cleveland Association

The proposed Constitution of the Cleveland Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on January 6th, 1915.

At the meeting of the Association on December 18th, 1915, the following officers were elected for the ensuing year: President, Robert Hoffmann; Vice-President, Wilbur J. Watson; and Secretary-Treasurer, George H. Tinker.

Louisiana Association

At the meeting of the Louisiana Association of Members of the American Society of Civil Engineers (New Orleans, La.), on April 14th, 1915, the following officers were elected for the ensuing year: J. F. Coleman, President; W. B. Gregory and A. M. Shaw, Vice-Presidents; Ole K. Olsen, Treasurer; and E. H. Coleman, Secretary.

Northwestern Association

The proposed Constitution of the Northwestern Association of Members of the American Society of Civil Engineers (St. Paul and Minneapolis, Minn.) was considered and approved by the Board of Direction of the Society on November 4th, 1914.

The officers of the Association are as follows: President, W. L. Darling; First Vice-President, George L. Wilson; Second Vice-President, L. W. Rundlett; Secretary, R. D. Thomas; and Treasurer, A. F. Meyer.

Philadelphia Association

The meetings of the Philadelphia Association of Members of the American Society of Civil Engineers are held at the Engineers' Club of Philadelphia, 1317 Spruce Street.

The officers of the Association are as follows: President, Edward B. Temple; Vice-Presidents, Edgar Marburg and John Sterling Deans; Directors, J. W. Ledoux, H. S. Smith, Henry H. Quimby, and George A. Zinn; Past-Presidents, George S. Webster and Richard L. Humphrey; Treasurer, S. M. Swaab; and Secretary, W. L. Stevenson.

(Abstract of Minutes of Meeting)

January 3d, 1916.—The meeting was called to order; President Edward B. Temple in the chair; W. L. Stevenson, Secretary; and present, also, John W. Ledoux, President of the Engineers' Club of Philadelphia, and about 270 members of the two organizations, the meeting having been held as a joint meeting of the Association and the Engineers' Club.

The following resolution was passed unanimously:

"The Philadelphia Association endorses Mr. Henry H. Quimby of Philadelphia for representative of the Fourth District of the Nominating Committee of the American Society of Civil Engineers."

President Temple addressed the meeting briefly relative to the signal honor shown the Engineering Profession and the Association by the appointment of Mr. George S. Webster as Director of the Department of Wharves, Docks, and Ferries, and of Mr. George E. Datesman as Director of the Department of Public Works, of Philadelphia.

An illustrated lecture on the "Electrification of the Pennsylvania Railroad Lines from Broad Street, Philadelphia, to Paoli, Pa.", was then given by Mr. George Gibbs.

A vote of thanks was tendered Mr. Gibbs.

Adjourned.

Portland, Ore., Association

At the Annual Meeting of the Association on September 28th, 1915, the following officers were elected for the ensuing year: President, J. P. Newell; First Vice-President, John T. Whistler; Second Vice-President, E. B. Thomson; Treasurer, Russell Chase; and Secretary, J. A. Currey.

St. Louis Association

The proposed Constitution of the St. Louis Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on October 7th, 1914.

The following officers have been elected: President, J. A. Ockerson; First Vice-President, Edward E. Wall; Second Vice-President, F. J. Jonah; Secretary-Treasurer, Gurdon G. Black. The meetings of the Association are held at the Engineers' Club Auditorium.

San Diego Association

The San Diego Association of Members of the American Society of Civil Engineers was organized on February 5th, 1915, and officers have been elected, as follows: President, George Butler; Vice-President, Willis J. Dean; and Secretary-Treasurer, J. R. Comly.

At its meeting of September 20th, 1915, the Board of Direction considered and approved the proposed Constitution of the San Diego Association of Members of the American Society of Civil Engineers.

Seattle Association

The Seattle Association of Members of the American Society of Civil Engineers was organized on June 30th, 1913. At its meeting

of January 25th, 1915, the following officers were elected for the ensuing year: President, R. H. Ober; Vice-President, A. S. Downey; and Secretary-Treasurer, Carl H. Reeves.

Southern California Association

The Southern California Association of Members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular bimonthly meetings, with banquet, on the second Wednesday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 P. M. every Wednesday, and the place of meeting may be ascertained from the Secretary of the Association, W. K. Barnard, 701 Central Building, Los Angeles, Cal.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in Los Angeles, and any such member will be gladly welcomed as a guest at any of the meetings or luncheons.

Spokane Association

The proposed Constitution of the Spokane Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on March 4th, 1914. Ulysses B. Hough is President.

Texas Association

The proposed Constitution of the Texas Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on December 31st, 1913. The headquarters of the Association is Dallas, Tex. John B. Hawley is President.

MINUTES OF MEETINGS OF SPECIAL COMMITTEES TO REPORT UPON ENGINEERING SUBJECTS

Special Committee to Investigate Conditions of Employment of, and Compensation of, Civil Engineers

January 4th, 1916.—The meeting was held at the House of the Society. Present, Nelson P. Lewis (Chairman), John A. Bensel, S. L. F. Deyo, William V. Judson, and George W. Tillson (Secretary).

The Chairman made a statement regarding the work done in securing information since the previous circular letter had been sent out, and submitted a preliminary draft of a report, with diagrams, relative to that information. After discussion it was decided to prepare new diagrams, on a slightly different basis, and submit them with the report.

It was also decided that the report of the Committee, to be presented to the Annual Meeting, should state that nothing further of value could be obtained with respect to the compensation of civil engineers, and that the Committee had not attempted to procure information relative to the conditions of engineering employment, as it would be extremely difficult to secure reliable data on that subject; but, if the Society so directed, the Committee would undertake to obtain all possible information during the coming year.

Special Committee on Valuation of Public Utilities

December 27th, 28th, 29th, 30th, 31st, 1915, and January 1st, 1916.—Fifteen sessions were held at the Society House. Present, F. P. Stearns (Chairman), C. S. Churchill, W. G. Raymond, H. E. Riggs, J. P. Snow, W. J. Wilgus, and Leonard Metcalf (Secretary). The day sessions, in general, lasted from 9 A. M. to 6 P. M., and the night sessions from 8 to 10 P. M. Six of the seven members of the Committee were present at all the sessions, and the seventh member was present at five sessions.

Three and one-half days were devoted to the discussion of the revised draft of the chapter on "Reproduction Cost", previously outlined and modified in correspondence; two days were devoted to discussion of the chapter on "Depreciation"; and one-half day to the revised draft of the chapter on "Development Expense".

The revision of the various chapters, discussed in such a manner as to accord with the presentation of the subject agreed on in conference, was delegated to the different members of the Committee, with the understanding that a copy of the revised drafts would be sent to all members for further discussion and revision by correspondence.

The meeting was adjourned subject to the call of the Chairman—it being suggested that the next session be held during April, 1916.

PRIVILEGES OF ENGINEERING SOCIETIES EXTENDED TO MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

Members of the American Society of Civil Engineers will be welcomed by the following Engineering Societies, both to the use of their Reading Rooms, and at all meetings:

American Institute of Electrical Engineers, 33 West Thirty-ninth Street, New York City.

American Institute of Mining Engineers, 29 West Thirty-ninth Street, New York City.

American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York City.

Architekten-Verein zu Berlin, Wilhelmstrasse 92, Berlin W. 66, Germany.

Associação dos Engenheiros Civis Portuguezes, Lisbon, Portugal.

Australasian Institute of Mining Engineers, Melbourne, Victoria, Australia.

Boston Society of Civil Engineers, 715 Tremont Temple, Boston, Mass.

Brooklyn Engineers' Club, 117 Remsen Street, Brooklyn, N. Y.

Canadian Society of Civil Engineers, 176 Mansfield Street, Montreal, Que., Canada.

Civil Engineers' Society of St. Paul, St. Paul, Minn.

Cleveland Engineering Society, Chamber of Commerce Building, Cleveland, Ohio.

Cleveland Institute of Engineers, Middlesbrough, England.

Dansk Ingeniorforening, Amaliegade 38, Copenhagen, Denmark.

Detroit Engineering Society, 46 Grand River Avenue, West, Detroit, Mich.

Engineers and Architects Club of Louisville, 1412 Starks Building, Louisville, Ky.

Engineers' Club of Baltimore, 6 West Eager Street, Baltimore, Md.

Engineers' Club of Kansas City, E. B. Murray, Secretary, 920 Walnut Street, Kansas City, Mo.

Engineers' Club of Minneapolis, 17 South Sixth Street, Minneapolis, Minn.

Engineers' Club of Philadelphia, 1317 Spruce Street, Philadelphia, Pa.

Engineers' Club of St. Louis, 3817 Olive Street, St. Louis, Mo.

Engineers' Club of Toronto, 96 King Street, West, Toronto, Ont., Canada.

Engineers' Club of Trenton, Trent Theatre Building, 12 North Warren Street, Trenton, N. J.

Engineers' Society of Northeastern Pennsylvania, 415 Washington Avenue, Scranton, Pa.

Engineers' Society of Pennsylvania, 31 South Front Street, Harrisburg, Pa.

Engineers' Society of Western Pennsylvania, 2511 Oliver Building, Pittsburgh, Pa.

Institute of Marine Engineers, The Minories, Tower Hill, London, E., England.

Institution of Engineers of the River Plate, Calle 25 de Mayo 195, Buenos Aires, Argentine Republic.

Institution of Naval Architects, 5 Adelphi Terrace, London, W. C., England.

Junior Institution of Engineers, 39 Victoria Street, Westminster, S. W., London, England.

Koninklijk Instituut van Ingenieurs, The Hague, The Netherlands.

Louisiana Engineering Society, State Museum Building, Chartres and St. Ann Streets, New Orleans, La.

Memphis Engineers' Club, Memphis, Tenn.

Midland Institute of Mining, Civil and Mechanical Engineers, Sheffield, England.

Montana Society of Engineers, Butte, Mont.

North of England Institute of Mining and Mechanical Engineers, Newcastle-upon-Tyne, England.

Oesterreichischer Ingenieur- und Architekten-Verein, Eschenbachgasse 9, Vienna, Austria.

Oregon Society of Civil Engineers, Portland, Ore.

Pacific Northwest Society of Engineers, 312 Central Building, Seattle, Wash.

Rochester Engineering Society, Rochester, N. Y.

Sachsischer Ingenieur- und Architekten-Verein, Dresden, Germany.

Sociedad Colombiana de Ingenieros, Bogota, Colombia.

Sociedad de Ingenieros del Peru, Lima, Peru.

Societe des Ingenieurs Civils de France, 19 rue Blanche, Paris, France.

Society of Engineers, 17 Victoria Street, Westminster, S. W., London, England.

Svenska Teknologforeningen, Brunkebergstorg 18, Stockholm, Sweden.

Tekniske Forening, Vestre Boulevard 18–1, Copenhagen, Denmark.

Western Society of Engineers, 1737 Monadnock Block, Chicago, Ill.

ACCESSIONS TO THE LIBRARY

(From January 4th, to February 1st, 1916)

DONATIONS*

RIVER DISCHARGE

Prepared for the Use of Engineers and Students. By John Clayton Hoyt and Nathan Clifford Grover, Members, Am. Soc. C. E. Third Edition, Revised and Enlarged. Cloth, 9 x 6 in., illus., 12 + 182 pp. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1914. $2.00.

The application of water to power, irrigation, and other engineering works, as well as the methods of collecting and using data concerning the flow of streams, have been developed to such an extent that the work has come to be recognized, it is stated, as a branch of hydraulics to be included in regular courses of engineering schools, and as essential to the work of the practicing engineer. In this the third edition of their book, the authors include concise and clear descriptions of instruments and equipment for measuring flowing water, as well as their installation, methods of measuring the flow of natural and artificial channels, together with methods and procedure of analyzing and interpretating stream-flow data, conditions affecting the flow of water in streams, and the routine of the selection, establishment, and maintenance of gauging stations. Definitions of terms used in the work are given, as well as tables for facilitating the computation of various hydraulic problems, and lengthy theoretical and mathematical discussions have been avoided, it is said, in order to adapt the use of the book to the needs of hydraulic engineers, superintendents of irrigation, managers of power plants, engineering students, etc. The Chapter headings are: Introduction; Instruments and Equipment; Velocity-Area Stations; Weir Stations; Discussion and Use of Data; Conditions Affecting Stream Flow; Tables; Index.

LIVE-LOAD STRESSES IN RAILWAY BRIDGES

With Formulas and Tables. By George E. Beggs, Assoc. M. Am. Soc. C. E. Cloth, 9¼ x 5¾ in., illus., 4 + 123 pp. New York, John Wiley and Sons, Inc.; London, Chapman & Hall, Limited, 1916. $2.00.

In this volume, the author, it is stated, has treated stresses caused by moving concentrated loads by the combined use of influence lines and algebraic methods, the influence lines being connected with tables of moment sums and load sums in a new and practical manner. The preface states that the main feature of the text is contained in two equations which give an easy and exact solution of the maximum live-load stresses in any structure, the influence lines of which can be drawn. A second feature is stated to be the application of these equations to the simpler structures, such as girder bridges, pier reactions, etc., fully worked-out problems being included. The text is supplemented by a very complete set of useful tables. The Contents are: Influence Lines: Definitions and Use; Sum and Rate of Variation of Ordinate-Load Products Between Two Diverging Lines; Sum and Rate of Variation of Ordinate-Load Products for Any Influence Line; Girder Bridge Without Panels; General Formulas for Pier Reaction and Its Rate of Variation; Girder Bridge With Panels; Through Pratt Truss; Three-Hinged Arch: Equivalent Uniform Loads; Method of Calculating Table of Load Sums and Moment Sums for Any Standard Loading; Summary of Formulas; Tables.

POLE AND TOWER LINES FOR ELECTRIC POWER TRANSMISSION.

By R. D. Coombs, M. Am. Soc. C. E. Cloth, 9 x 6½ in., illus., 8 + 272 pp. New York and London, McGraw-Hill Book Company, Inc., 1916. $2.50.

The number and length of transmission and distribution lines have increased with the growth of the electric light and power industries until they have become, it is stated, pretentious systems, the relation of which to other industries and to the public must be considered. In this book the author, it is said, has considered the question from the viewpoint of the structural engineer by discussing and describing in detail the design and construction of modern transmission lines and their supports, including loading requirements, kinds of wires and cables, wooden, steel, and concrete poles and towers, foundations, protective coatings, cost estimates.

* Unless otherwise specified, books in this list have been donated by the publishers.

etc. He has also included in the subject-matter the Joint Report Specifications for Crossings and a General Specification for Lines. Purely electrical problems, such as voltage, size of wires, insulator design, etc., have been omitted, the author's idea, as stated in the preface, having been to develop a clearer perception of the application of the laws of mechanics to the subject discussed. The Contents are: Types of Construction; Loading; Wires and Cables; Design; Wooden Poles; Steel Poles and Towers; Special Structures; Concrete Poles; Foundations; Protective Coatings; Line Material; Erection and Costs; Protection; Specifications; Index.

REINFORCED CONCRETE CONSTRUCTION:

Volume III, Bridges and Culverts. Prepared in the Extension Division of the University of Wisconsin, by George A. Hool, Assisted by Frank C. Thiessen. (Engineering Educational Series.) Cloth, 9¼ x 6¼ in., illus., 22 + 688 pp. New York and London, McGraw-Hill Book Company, Inc., 1916. $5.00.

This volume, it is stated, was originally planned to treat of the various types of reinforced concrete structures not mentioned in Volumes I and II. On account of the numerous requests for material on the analysis and design of arch bridges, however, it has seemed advisable to devote this volume to bridges and culverts in an attempt to meet the needs of students who have requested a textbook which is neither too complex or abbreviated for the average engineer to understand. This has been accomplished, it is stated, by omitting intricate mathematical analysis involving Calculus, by avoiding mathematical sign language whenever possible, and by including complete methods of design of both symmetrical and unsymmetrical arches, not only of single span but of multiple spans with elastic piers. Two entirely different methods of arch analysis are given, it is stated, and in order to gain clearness, the subject-matter has been carefully arranged and numerous drawings and illustrations are included. The Contents are: Part I, Arch Bridge; Part II, Slab and Girder Bridges; Part III, Culverts; Part IV, Notes on Construction Plant, by A. W. Ransome; Part V, Notes on Estimating, by Leslie H. Allen; Part VI, The Artistic Design of Concrete Bridges, by William J. Titus; Part VII, The Construction in Detail of Several Types of Concrete Bridges, by Albert M. Wolf; Part VIII, European Concrete Bridges, by Philip Aylett and P. J. Markmann; Appendix: General Notation Used in Part I; Index.

ENGINEERING AS A CAREER:

A Series of Papers by Eminent Engineers. Edited by F. H. Newell, M. Am. Soc. C. E., and C. E. Drayer. Cloth, 7½ x 5¼ in., 12 + 214 pp. New York, D. Van Nostrand Company, 1916. $1.00.

The aim, in this book, has been, it is stated, to present to young men, to teachers, and to parents or advisors, some of the facts concerning the Engineering Profession in general and of different branches of engineering in particular. Each chapter has been written by an experienced engineer or by an expert in some branch of engineering, and each, it is said, has endeavored to answer the question as to opportunities and requisites for success and causes of failure in the Engineering Profession. The Contents are: Introduction; The Engineer and His Profession, by A. J. Himes; Shall My Boy Become an Engineer? by Franklin De R. Furman; Mechanical Engineering, by Worcester R. Warner; Railway Engineering, by A. W. Johnston; Hydraulic Engineering, by Chester W. Larner; Metallurgical Engineering, by J. H. Herron; Electrical Engineering, by W. H. Abbott; Chemical Engineering, by M. C. Whitaker; Iron and Steel Making, by S. T. Wellman; Marine Engineering, by J. C. Workman; Sanitary Engineering, by R. Winthrop Pratt; Municipal Engineering, by Robert Hoffmann; Municipal Needs, by Rudolph Blankenburg; Bridge Engineering, by Frank C. Osborn; Architecture, by Benjamin S. Hubbell; Mining, by F. B. Richards; Opportunities for a Mining Engineer, by Henry S. Munroe; The Lure of Private Practice, by Ernest McCullough; Vocational Guidance, by James F. Barker; Scientific Manufacturing and Its Opportunities, by Waldemar Kaempffert; Incomes of Technically Trained Men, by David Edgar Rice; Technical Man in Business, by John Ritchie, Jr.

INDEXING AND FILING:

A Manual of Standard Practice. By E. R. Hudders. Cloth, 8 x 6 in., illus., 12 + 292 pp. New York, The Ronald Press Company, 1916.

This volume has been written, it is stated in the preface, with the idea of clearing up some of the obscure points encountered in the indexing and filing of records, such as are ordinarily found in commercial organizations, and of setting

forth the basic principles necessary to the establishment of a manual of standard practice. Some of the chapters are applicable, it is stated, to the filing of professional, semi-professional, and institutional records, and concrete examples are included to illustrate the author's ideas. Descriptions of various kinds of filing equipments and supplies are also given. The Contents are: Terminology and Definitions; Indexes; Rules for Writing Indexes; Rules for Filing Index Cards; Filing of Papers; Direct Alphabetic Filing; Alphabetic-Numeric Filing; Numeric Filing; Geographic Filing; Subject Filing; Lost Papers; Transferring; Central Filing Department; Classing and Grouping of Records; Notation; Information and Data Files; Catalog and Pamphlet Filing; Purchase Records; Sales Records; Credit Records; Filing of Sales Invoices; Filing of Purchase Invoices; Check and Voucher Filing; Filing of Electrotypes and Cuts; Filing Equipment; Filing in Lawyers' Offices; Architectural Filing; Files of an Accountant; Index.

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A History of Travel in America, Showing the Developments of Travel and Transportation from the Crude Methods of the Canoe and the Dog-Sled to the Highly Organized Railway Systems of the Present, Together with a Narrative of the Human Experiences and Changing Social Conditions that Accompanied this Economic Conquest of the Continent. By Seymour Dunbar. 4 Vol. Indianapolis, 1915.

Painting by Immersion and by Compressed Air: A Practical Handbook. By Arthur Seymour Jennings. New York and London, 1915.

Conference of Building Inspectors and Building Commissioners of the United States and Dominion of Canada at the Hotel Astor, New York City, May 14th, 1915.

The Rare Earth Industry, Including the Manufacture of Incandescent Mantles, Pyrophoric Alloys, and Electrical Glow Lamps. By Sydney J. Johnstone. Together with a Chapter on the Industry of Radioactive Substances, by Alexander S. Russell. New York, 1915.

Return as to Water Undertakings in England and Wales. Local Government Board. London, 1915.

The World Almanac and Encyclopedia, 1916. New York.

Forscherarbeiten auf dem Gebiete des Eisenbetons: Heft 25: Die Rammwirkung im Erdreich, Versuche auf neuer Grundlage. Von Karl Zimmermann. Berlin, 1915.

Forschungsarbeiten auf dem Gebiete des Ingenieurwesens. Herausgegeben vom Verein Deutscher Ingenieure. Hefte 174, 175, 176, 177, 178, 179. Berlin, 1915.

Brooklyn Daily Eagle Almanac, 1916: A Book of Information, General of the World and Special of New York City and Long Island. Brooklyn.

The Engineering Index Annual for 1915: Compiled from the Engineering Index Published Monthly in the *Engineering Magazine* During 1915. New York, 1915.

Lehrbuch der Eisenhüttenkunde: Verfast für den Unterricht, den Betrieb, und das entwerfen von Eisenhüttenanlagen. Von Bernhard Osann. Erster Band: Roheisenerzeugung. Leipzig, 1915.

The Science and Practice of Management. By A. Hamilton Church. New York, 1914.

An Introduction to the Theory of Value on the Lines of Menger, Wieser, and Böhm-Bawerk. By William Smart. New Edition. London, 1910.

SUMMARY OF ACCESSIONS

(From January 4th, to February 1st, 1916)

Donations (including 7 duplicates)	249
By purchase	19
Total	268

MEMBERSHIP

(From January 7th, to February 3d, 1916)

ADDITIONS

MEMBERS		Date of Membership.
BROWN, ELLIOT CHIPMAN. Pres., Elliot C. Brown Co., 70 East 45th St., New York City	Assoc. M. M.	Oct. 31, 1911 Jan. 18, 1916
CLOSSON, EDGAR STONE. Town Engr., 3 Claridge Court, Montclair, N. J	Jun. Assoc. M. M.	Sept. 4, 1906 May 2, 1911 Jan. 18, 1916
DE LA MATER, STEPHEN TRUESDELL. Cons. Engr., 520 Marquette Bldg., Chicago, Ill.	Assoc. M. M.	Nov. 4, 1908 Jan. 18, 1916
DERR, HOMER MUNRO. State Engr., State Capitol, Pierre, S. Dak	Assoc. M. M.	Jan. 4, 1910 Jan. 18, 1916
EDWARDS, LLEWELLYN NATHANIEL. Superv. Engr. of Bridges, Ry. and Bridge Section, Dept. of Works, P. O. Box 23, Toronto, Ont., Canada	Assoc. M. M.	Mar. 1, 1910 Jan. 18, 1916
FITCH, SQUIRE EARNEST. County Asst. Engr., Chautauqua County, New York State Highway Dept., 42 Academy St., Westfield, N. Y	Assoc. M. M.	July 9, 1906 Jan. 18, 1916
GOWDY, ROY COTSWORTH. Chf. Engr., Fort Worth & Denver City Ry., 404 Denver-Record Bldg., Fort Worth, Tex	Assoc. M. M.	Oct. 31, 1911 Jan. 18, 1916
HIDINGER, LEROY LEMAYNE. Vice-Pres. and Treas., Morgan Eng. Co., 610 Goodwyn Inst. Bldg., Memphis, Tenn	Assoc. M. M.	Oct. 4, 1910 Jan. 18, 1916
JONES, FRED ATWOOD. Cons. Engr., 311 Sumpter Bldg., Dallas, Tex		Dec. 6, 1915
MAYHEW, ALFRED BOARDMAN. Asst. Engr., Miami Conservancy Dist., Dayton, Ohio.	Assoc. M. M.	Nov. 8, 1909 Jan. 18, 1916
ODONI, VINCENT PHILLIP. Chf. Engr., Tucson Farms Co., P. O. Box 187, Tucson, Ariz.	Assoc. M. M.	April 4, 1911 Jan. 18, 1916
OSBORN, IRWIN SELDEN. Cons. Engr. (The Allen-Osborn Co.), 957 Rose Bldg., Cleveland, Ohio	Assoc. M. M.	Dec. 3, 1912 Jan. 18, 1916
SACKETT, ROBERT LEMUEL. Dean of Eng., Pennsylvania State Coll., State College, Pa	Assoc. M. M.	Feb. 6, 1907 Jan. 18, 1916
SANBORN, MORTON FRANKLIN. Asst. San. Engr., New York State Dept. of Health, 30 Ten Eyck Ave., Albany, N. Y	Assoc. M. M.	Mar. 1, 1910 Jan. 18, 1916
SAVAGE, JOHN LUCIAN. Designing Engr., A. J. Wiley, and the U. S. Reclamation Service, 611 Idaho Bldg., Boise, Idaho	Assoc. M. M.	May 1, 1907 Jan. 18, 1916

MEMBERS (*Continued*)

		Date of Membership.
SHOEMAKER, HARRY IVES. Care, Manila R. R., Manila, Philippine Islands	Assoc. M.	May 4, 1909
	M.	Nov. 10, 1915

ASSOCIATE MEMBERS

BALDWIN, ERNEST WOOD. Supervisor, Pacific Terminals, The Panama Canal, Balboa, Canal Zone, Panama		Dec. 6, 1915
BARTHOLOMEW, HERBERT. Pedro Miguel, Canal Zone, Panama		Dec. 6, 1915
BAYLIS, ROSWELL SPENCER. Huntington, N. Y		Dec. 6, 1915
BOWLUS, FRED DREXEL. Box 185, San Fernando, Cal	Jun.	Sept. 3, 1913
	Assoc. M.	Dec. 6, 1915
COVERT, JOHN FRANCIS. Chf. Engr., Sweetwater Water Co. and The San Diego Land Corporation, 406 Owl Drug Bldg., San Diego, Cal		Aug. 31, 1915
DAVIS, DANIEL ELIAS. Asst. Engr., Chester & Fleming, 1111 Union Bank Bldg., Pittsburgh, Pa	Jun.	Feb. 28, 1911
	Assoc. M.	Dec. 6, 1915
DOWNING, CARL E. Engr. in Chg., Belzoni Drainage Dist., P. O. Box 11, Belzoni, Miss.	Jun.	Oct. 1, 1913
	Assoc. M.	Dec. 6, 1915
ENGH, ARTHUR. Office Engr., C., B. & Q. R. R., 547 West Jackson Boulevard, Chicago, Ill		Jan. 17, 1916
FAUDE, FREDERIC MORRIS. Asst. Mgr., Cuyamaca Water Co., 916 Eighth St., San Diego, Cal		Dec. 6, 1915
FEILD, JULIAN CLARENCE. Cons. Engr., City of Denison, 105 Feild Bldg., Denison, Tex		Jan. 17, 1916
GARNER, CHESTER ARTHUR. 507 North Lake St., Warsaw, Ind		Nov. 3, 1915
HATCH, FLETCHER AMES. Chf. Engr., Santa Marta Div., United Fruit Co., Santa Marta, Colombia		Dec. 6, 1915
HOWES, BENJAMIN ALFRED. 70 Fifth Ave., New York City		Jan. 17, 1916
MCCLINTOCK, HALLETT EDWARD. Draftsman and Asst. Engr., U. P. R. R., 1810 Manderson St., Omaha, Nebr.		Dec. 6, 1915
MERRIMAN, RICHARD MANSFIELD. Cons. Engr., Central Valley, N. Y	Jun.	Jan. 3, 1907
	Assoc. M.	Jan. 17, 1916
PALEN, ARCHIBALD E. Highway Engr., U. S. Office of Public Roads, Care, Forest Service, Denver, Colo		Jan. 17, 1916
PICKERSGILL, WILLIAM COPELAND. Designing Engr., Water Supply Board, 661 Westminster St., Providence, R. I.		Jan. 17, 1916
RICHARDS, NATHANIEL ATHERTON. Secy. and New York Mgr., Purdy & Henderson, 45 East 17th St., New York City		Nov. 3, 1915
ROCHE, ALFRED EMMET. City Engr., Troy, N. Y		Jan. 17, 1916
SAMANS, WALTER. Asst. Engr. to Chf. Engr., B. & L. E. R. R., Greenville, Pa		Nov. 3, 1915

ASSOCIATE MEMBERS (*Continued*)

		Date of Membership.
STRONG, ARTHUR LEON. County Engr., Skagit County, Mt. Vernon, Wash		Dec. 6, 1915
SWETT, EVERETT HAROLD. Junior Engr., U. S. Reclamation Service, Montrose, Colo....	Jun.	Oct. 1, 1907
	Assoc. M.	Dec. 6, 1915
WILDER, ALVIN DUMOND. Asst. Engr., Spring Val. Water Co., San Francisco (Res., 2448 Prospect Street, Berkeley). Cal..	Jun.	Oct. 6, 1908
	Assoc. M.	Dec. 6, 1915

JUNIORS

BROKER, ALBERT EDWARD. Asst. County Highway Commr. of Milwaukee County, 2120 Grand Ave., Apartment 8, Milwaukee, Wis	Jan. 17, 1916
COTTON, WILLIAM OWEN. Idaho Falls, Idaho	Jan. 17, 1916
GARCIA, PEDRO. Asst. Engr., Peruvian Irrig. Service, P. O. Box No. 35, Lima, Peru	Dec. 6, 1915
RICHARDS, WALTER ALAN. Care, Hardaway Contr. Co., Whitney, N. C	Dec. 6, 1915
RUETTGERS, ARTHUR. Camp 9, U. S. Reclamation Service, Power, Mont	Dec. 6, 1915
UNDERWOOD, HARRISON AUBREY. Estimating and Erecting Engr., Christian Constr. Co., P. O. Box 343, Durham, N. C	Jan. 17, 1916
VEATCH, FRANCIS MONTGOMERY. 505 Mound St., Atchison, Kans	Jan. 6, 1915
WARFEL, ADAM COOPER. 208 North 53d St., Philadelphia, Pa	Dec. 6, 1915

RESIGNATIONS

MEMBERS	Date of Resignation.
HUSS, GEORGE MOREHOUSE	Jan. 17, 1916
OBREITER, JOSEPH WILLIAM	Jan. 26, 1916

ASSOCIATE MEMBERS

DAY, EDWARD BLISS	Jan. 17, 1916
DUNN, OSWALD THORPE	Jan. 17, 1916
FISCHER, GUILLERMO GUSTAVO	Dec. 31, 1915
KING, ROY STEVENSON	Jan. 17, 1916
MAHON, ROSS LE HUNT	Feb. 3, 1916
MALUKOFF, ALEXIS JOSEPH	Jan. 17, 1916
O'HARA, FRANCIS JOSEPH	Jan. 17, 1916
PLANT, FRANCIS BENJAMIN	Jan. 25, 1916
SANER, CURTIS CHARLES	Jan. 17, 1916
SHELMIRE, ROBERT WARREN	Dec. 31, 1915
WADDELL, FREDERICK CREELMAN	Dec. 31, 1915

JUNIORS	Date of Resignation.
Baines, William Henry	Jan. 17, 1916
Brinkerhoff, George Lockwood	Dec. 31, 1915
Calkins, Charles Dow	Jan. 25, 1916
Coburn, Horace Butterfield, Jr	Jan. 17, 1916
Curtis, Harold Edwin	Jan. 25, 1916
Font, Manuel	Jan. 17, 1916
Lemcke, Karl Wolfgang	Jan. 17, 1916
Lester, Homer Allan	Jan. 17, 1916
Peck, John Calvin	Jan. 25, 1916
Seeley, Henry Arthur	Jan. 17, 1916
Shaw, Guy Ray	Dec. 31, 1915
Smith, Walter Mickle, Jr	Dec. 31, 1915

DEATHS

Clark, Ludlow Victor. Elected Associate, October 4th, 1892; died December 28th, 1915.

Follett, William W. Elected Member, July 5th, 1893; died December 30th, 1915.

Hunt, Loren Edward. Elected Associate Member, June 3d, 1903; died January 9th, 1916.

Schneider, Charles Conrad. Elected Member, February 6th, 1884; Director, 1887, '98-1900; Vice-President, 1902-03; President, 1905; died January 8th, 1916.

Tatum, Sledge. Elected Member, January 4th, 1910; died January 18th, 1916.

Wilkes, James Knapp. Elected Associate Member, June 3d, 1891; Member, April 3d, 1906; died January 9th, 1916.

Williams, David. Elected Member, May 4, 1898; died November 27th, 1915.

Total Membership of the Society, February 3d, 1916, 7 893.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST

(January 4th, to February 1st, 1916)

NOTE.—*This list is published for the purpose of placing before the members of this Society, the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS

In the subjoined list of articles, references are given by the number prefixed to each journal in this list:

(1) *Journal,* Assoc. Eng. Soc., St. Louis, Mo., 30c.
(2) *Proceedings,* Engrs. Club of Phila., Philadelphia, Pa.
(3) *Journal,* Franklin Inst., Philadelphia, Pa., 50c.
(4) *Journal,* Western Soc. of Engrs., Chicago, Ill., 50c.
(5) *Transactions,* Can. Soc. C. E., Montreal, Que., Canada.
(6) *School of Mines Quarterly,* Columbia Univ., New York City, 50c.
(7) *Gesundheits Ingenieur,* München, Germany.
(8) *Stevens Institute Indicator,* Hoboken, N. J., 50c.
(9) *Engineering Magazine,* New York City, 25c.
(11) *Engineering* (London), W. H. Wiley, 432 Fourth Ave., New York City, 25c.
(12) *The Engineer* (London), International News Co., New York City, 35c.
(13) *Engineering News,* New York City, 15c.
(14) *Engineering Record,* New York City, 10c.
(15) *Railway Age Gazette,* New York City, 15c.
(16) *Engineering and Mining Journal,* New York City, 15c.
(17) *Electric Railway Journal,* New York City, 10c.
(18) *Railway Review,* Chicago, Ill., 15c.
(19) *Scientific American Supplement,* New York City, 10c.
(20) *Iron Age,* New York City, 20c.
(21) *Railway Engineer,* London, England, 1s. 2d.
(22) *Iron and Coal Trades Review,* London, England, 6d.
(23) *Railway Gazette,* London, England, 6d.
(24) *American Gas Light Journal,* New York City, 10c.
(25) *Railway Mechanical Engineer,* New York City, 20c.
(26) *Electrical Review,* London, England, 4d.
(27) *Electrical World,* New York City, 10c.
(28) *Journal,* New England Water-Works Assoc., Boston, Mass., $1.
(29) *Journal,* Royal Society of Arts, London, England, 6d.
(30) *Annales des Travaux Publics de Belgique,* Brussels, Belgium, 4 fr.
(31) *Annales* de l'Assoc. des Ing. Sortis des Ecoles Spéciales de Gand, Brussels, Belgium, 4 fr.
(32) *Mémoires et Compte Rendu des Travaux,* Soc. Ing. Civ. de France, Paris, France.
(33) *Le Génie Civil,* Paris, France, 1 fr.
(34) *Portefeuille Economiques des Machines,* Paris, France.
(35) *Nouvelles Annales de la Construction,* Paris, France.
(36) *Cornell Civil Engineer,* Ithaca, N. Y.
(37) *Revue de Mécanique,* Paris, France.
(38) *Revue Générale des Chemins de Fer et des Tramways,* Paris, France.
(39) *Technisches Gemeindeblatt,* Berlin, Germany, 0, 70m.
(40) *Zentralblatt der Bauverwaltung,* Berlin, Germany, 60 pfg.
(41) *Electrotechnische Zeitschrift,* Berlin, Germany.
(42) *Proceedings,* Am. Inst. Elec. Engrs., New York City, $1.
(43) *Annales des Ponts et Chaussées,* Paris, France.
(44) *Journal,* Military Service Institution, Governors Island, New York Harbor, 50c.
(45) *Coal Age,* New York City, 10c.
(46) *Scientific American,* New York City, 15c.
(47) *Mechanical Engineer,* Manchester, England, 3d.
(48) *Zeitschrift,* Verein Deutscher Ingenieure, Berlin, Germany, 1, 60m.
(49) *Zeitschrift für Bauwesen,* Berlin, Germany.
(50) *Stahl und Eisen,* Düsseldorf, Germany.
(51) *Deutsche Bauzeitung,* Berlin, Germany.
(52) *Rigasche Industrie-Zeitung,* Riga, Russia, 25 kop.
(53) *Zeitschrift,* Oesterreichischer Ingenieur und Architekten Verein, Vienna, Austria, 70h.
(54) *Transactions,* Am. Soc. C. E., New York City, $12.
(55) *Transactions,* Am. Soc. M. E., New York City, $10.
(56) *Transactions,* Am. Inst. Min. Engrs., New York City, $6.

(57) *Colliery Guardian*, London, England, 5d.
(58) *Proceedings*, Engrs.' Soc. W. Pa., 2511 Oliver Bldg., Pittsburgh, Pa., 50c.
(59) *Proceedings*, American Water-Work Assoc., Troy, N. Y.
(60) *Municipal Engineering*, Indianapolis, Ind., 25c.
(61) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
(62) *Steel and Iron*, Thaw Bldg., Pittsburgh, Pa., 10c.
(63) *Minutes of Proceedings*, Inst. C. E., London, England.
(64) *Power*, New York City, 5c.
(65) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
(66) *Journal of Gas Lighting*, London, England, 6d.
(67) *Cement and Engineering News*, Chicago, Ill., 25c.
(68) *Mining Journal*, London, England, 6d.
(69) *Der Eisenbau*, Leipzig, Germany.
(71) *Journal*, Iron and Steel Inst., London, England.
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(73) *Electrician*, London, England, 18c.
(74) *Transactions*, Inst. of Min. and Metal., London, England.
(75) *Proceedings*, Inst. of Mech. Engrs., London, England.
(76) *Brick*, Chicago, Ill., 20c.
(77) *Journal*, Inst. Elec. Engrs., London, England, 5s.
(78) *Beton und Eisen*, Vienna, Austria, 1, 50m.
(79) *Forscherarbeiten*, Vienna, Austria.
(80) *Tonindustrie Zeitung*, Berlin, Germany.
(81) *Zeitschrift für Architektur und Ingenieurwesen*, Wiesbaden, Germany.
(82) *Mining and Engineering World*, Chicago, Ill., 10c.
(83) *Gas Age*, New York City, 15c.
(84) *Le Ciment*, Paris, France.
(85) *Proceedings*, Am. Ry. Eng. Assoc., Chicago, Ill.
(86) *Engineering-Contracting*, Chicago, Ill., 10c.
(87) *Railway Engineering and Maintenance of Way*, Chicago, Ill., 10c.
(88) *Bulletin* of the International Ry. Congress Assoc., Brussels, Belgium.
(89) *Proceedings*, Am. Soc. for Testing Materials, Philadelphia, Pa., $5.
(90) *Transactions*, Inst. of Naval Archts., London, England.
(91) *Transactions*, Soc. Naval Archts. and Marine Engrs., New York City.
(92) *Bulletin*, Soc. d'Encouragement pour l'Industrie Nationale, Paris, France.
(93) *Revue de Métallurgie*, Paris, France, 4 fr. 50.
(95) *International Marine Engineering*, New York City, 20c.
(96) *Canadian Engineer*, Toronto, Ont., Canada, 10c.
(98) *Journal*, Engrs. Soc. Pa., Harrisburg, Pa., 30c.
(99) *Proceedings*, Am. Soc. of Municipal Improvements, New York City, $2.
(100) *Professional Memoirs*, Corps of Engrs., U. S. A., Washington, D. C., 50c.
(101) *Metal Worker*, New York City, 10c.
(102) *Organ für die Fortschritte des Eisenbahnwesens*, Wiesbaden, Germany.
(103) *Mining and Scientific Press*, San Francisco, Cal., 10c.
(104) *The Surveyor and Municipal and County Engineer*, London, England, 6d.
(105) *Metallurgical and Chemical Engineering*, New York City, 25c.
(106) *Transactions*, Inst. of Min. Engrs., London, England, 6s.
(107) *Schweizerische Bauzeitung*, Zürich, Switzerland.
(108) *Iron Tradesman*, Atlanta, Ga., 10c.
(109) *Journal*, Boston Soc. C. E., Boston, Mass., 50c.
(110) *Journal*, Am. Concrete Inst., Philadelphia, Pa., 50c.
(111) *Journal of Electricity, Power and Gas*, San Francisco, Cal., 25c.
(112) *Internationale Zeitschrift für Wasser-Versorgung*, Leipzig, Germany.
(113) *Proceedings*, Am. Wood Preservers' Assoc., Baltimore, Md.
(114) *Journal*, Institution of Municipal and County Engineers, London, England, 1s. 6d.

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Military.

Modern Heavy High Elevation Artillery.* (From *Kriegs Technische Zeitschrift.*) **(19)** Dec. 11, 1915.
Munitions Making for Small Manufacturers.* Gerardus Harrisson. **(9)** Jan.
Making the 6-in. British High-Explosive Shells.* **(20)** Jan. 6.
Modern Artillery and Future Development.* Logan Cresap. **(20)** Jan. 6.
Eine neuzeitliche französische Kaserne. Machwirth. **(40)** Aug. 25, 1915.
Kaserne für das Telegraphen-Bataillon Nr. 4 in Karlsruhe.* **(40)** Oct. 13, 1915.

Mining.

The German Potassium Salts.* Alfred Gradenwitz. **(19)** Dec. 11, 1915.
Heavy Timber Construction.* P. B. McDonald. **(103)** Dec. 25, 1915.
Safety Measures in the Use of Explosives. Wm. Cullen. (From paper read before the Chemical, Metallurgical and Min. Soc. of South Africa.) **(57)** Dec. 31, 1915.
The Drumheller Coal Field, Alberta.* D. A. Macaulay. (From *Bulletin* of the Canadian Min. Inst.) **(57)** Dec. 31, 1915.
Controlling Roof Weights (in Mines).* W. Dakin. (Paper read before the National Assoc. of Colliery Mgrs.) **(22)** Dec. 31, 1915.

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Mining—(Continued).

Some of the New Things in Mining in 1915.* (82) Jan. 1.
Drilling in Narrow Stopes. P. B. McDonald. (103) Jan. 1.
Workmen's Compensation Law and Mine Safety. H. M. Wilson. (Paper read before the Coal Min. Inst. of America.) (45) Jan. 1.
The Tom Reed-Gold Road Mining District, Arizona.* J. D. Sperr. (16) Jan. 1.
Dredging Operations at the Beginning of 1916.* (82) Jan. 1.
A New Method of Mining Coal. John Timmons. (19) Jan. 1.
Underwood, a Modern Colliery.* (45) Jan. 1.
The Fire at the Griff Clara Pit, Warwickshire, August, 1915. F. Povey-Harper. (57) Jan. 7.
Battery Signalling Bells. G. M. Harvey. (Paper read before the Assoc. of Min. Elec. Engrs.) (22) Jan. 7.
General Review of Mining in the United States in 1915. P. E. Barbour. (16) Jan. 8.
Gold Dredging in 1915. Robert E. Cranston. (16) Jan. 8.
The Uralsk Province and Its Oilfields. F. A. Holiday. (Abstract of paper read before the Institution of Petroleum Technologists.) (29) Jan. 14.
Theoretical Considerations Governing the Persistence of Ore.* T. A. Rickard. (Abstract of paper read before the Inst. M. and M.) (103) Jan. 15.
Mining Districts of Northern Ontario.* Robert Livermore. (From *The Technology Monthly and Harvard Engineering Journal.*) (103) Jan. 15.
Economics of the World's Supply of Copper.* Thomas T. Read. (Abstract of paper read before the Inter. Eng. Congress.) (103) Jan. 15.
Important Features in Mine-Ventilating Fans.* H. H. Valiquet. (45) Jan. 15.
A New Method of Stripping Iron Ore on the Mesabi Range, Minnesota.* Bradlee Van Brunt. (82) Jan. 15.
Uniform Mine Legislation. (Discussion before the Mine Inspectors' Inst.) (45) Serial beginning Jan. 15.
Mining by Concentration Method.* W. H. Howarth. (Paper read before the Coal Min. Inst. of Am.) (45) Jan. 15.
Mine Warehouse System. E. I. Roberts. (45) Serial beginning Jan. 15.
Coal Stripping, Rush Run, Ohio.* (45) Jan. 22.
Effect of Barometric Pressure to Derange or Stop Ventilation. F. C. Cornet. (45) Jan. 22.
A New Firedamp Detector.* George A. Burrell. (Paper read before the West Virginia Coal Min. Inst. and the Coal Min. Inst. of Am.) (45) Jan. 22.
Design for Mine Car and Rolling Side-Dump Tipple.* Roy F. Smith. (16) Jan. 22.
A California Dredge with Two Tailings Stackers.* Lewis H. Eddy. (16) Jan. 22.
Pumping Installations in the Leadville District.* Albert E. Guy. (82) Jan. 22.
Jigs on a California Dredge.* Lewis H. Eddy. (16) Jan. 29.
Stripping the Hillcrest Iron Mine with a Sand Pump.* (16) Jan. 29.

Miscellaneous.

Broader Training for the Engineer. Alexander C. Humphreys. (8) Oct., 1915.
The Broader Duties of the Engineer. J. C. Ralston. (Paper read before the Oregon Soc. of Engrs.) (1) Dec., 1915.
Equitable Specifications and Contracts. Hillis F. Hackedorn. (Paper read before the Engrs. Club of St. Louis and Assoc. Eng. Societies of St. Louis.) (1) Dec., 1915.
The Indian Jute Industry. C. C. McLeod. (29) Dec. 24, 1915.
What the Engineering Society Owes to Its Members. F. H. Newell. (Paper read before the Am. Assoc of Engrs.) (86) Dec. 29, 1915.
Some Notes on the Writing of Compound Technical Terms. C. W. Park. (From *Bulletin* of the Soc. for the Promotion of Eng. Education.) (86) Dec. 29, 1915.
The Origin of English Measures of Length. Charles M. Watson. (29) Dec. 31, 1915.
The Linear Hot-Wire Anemometer and Its Applications in Technical Physics.* Louis Vessot-King. (3) Jan.
Science in Its Relation to Engineering. John A. Brashear. (55) Jan.
Cost-Keeping and Efficiency in Works of the Engineer Department.* Stuart C. Godfrey. (100) Jan.
The Development of a Dynamic Theory of Soil Fertility. Frank K. Cameron. (3) Jan.
A 32-Element Harmonic Synthesizer.* Dayton C. Miller. (3) Jan.
The Hardwood Distillation Industry. G. W. Katzenstein. (From the *Journal of Industrial and Chemical Engineering.*) (19) Jan. 1.
The Development of the True Function of the Commission. William J. Hagenah. (27) Jan. 1.
Pick Rational Plant Units for Depreciation Accounting. Robert G. Klotz. (13) Jan. 6.
Jersey Combination Shop's Efficient Service.* (101) Jan. 7.

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Miscellaneous—(Continued).

Field Lithography Permits Rapid Production of Maps. D. A. Tomlinson. (14) Jan. 8.
Regulation of Public Utilities. C. A. Prouty. (Paper read before the Pan-American Scientific Congress.) (15) Jan. 14.
Co-operation of Societies Needed to Secure Equitable Specifications and Contracts. (14) Jan. 15.
The Pine Needle Oil Industry.* Samuel J. Record. (46) Jan. 22.
Report of the Committee on Nomenclature and Standards of the Illuminating Engineering Society. (24) Jan. 24.
Das Grundgesetz des Wärmeüberganges. Wilhelm Nusselt. (7) Serial beginning Oct. 16, 1915.
Das Benzin, seine Gewinnung, Beschaffenheit und Lagerung. H. Strache. (53) Serial beginning Dec. 24, 1915.

Municipal.

Concrete Roads of Wayne County, Michigan. (60) Dec., 1915.
Durability of Creosoted Block Pavements Increased by Modern Methods of Treatment.* Frank W. Cherrington. (60) Dec., 1915.
The Administration of European Cities. Julius Pitzman. (Paper read before the Engrs. Club of St. Louis.) (1) Dec., 1915.
Arterial Roads in Greater London. W. R. Davidge. (Paper read before the Town Planning Inst.) (104) Dec. 17, 1915.
Bituminous Resurfacing of Old Roads.* J. C. Travilla. (Paper read before the Inter. Road Congress.) (60) Jan.
Sanitary Provisions Being Inserted in Scottish Town Planning Schemes. Wm. Ross Young. (114) Jan.
Pelham Manor Concrete Road.* Charles A. Mullen. (60) Jan.
Motorization Effects Big Savings in New York Fire Department.* (60) Jan.
An Example of Modern Practice in Road Improvement, Fayette County, Kentucky.* (86) Jan. 5.
Progress in Asphalt Refining; With Notes on Mexican Asphaltic Crudes. Leroy M. Law. (Abstract from paper read before the Worcester Convention.) (96) Jan. 6.
Canadian Highway Development; With Notes Regarding Ontario's System. William A. McLean. (Abstract from paper read before the Inter. Road Congress.) (96) Jan. 6.
Morgan Park, A Beautiful Steel-Mill Town.* (20) Jan. 6.
Reducing Hillside Street Grade from 29 to 16 Per Cent.* (13) Jan. 6.
Dual Type of Brick Paving Aids Traffic on Grades.* (14) Jan. 8.
Proportioning of Concrete for Road Work, Suggestions for Improvement and Obstacles in the Way. W. W. Crosby. (86) Jan. 12.
Economic Highway Construction; An Analysis of Roadway Sections.* F. W. Harris. (86) Jan. 12.
Laying a Monolithic Brick Pavement in Car Track.* (13) Jan. 13.
Examination of Bituminous Road Materials. Prevost Hubbard and Charles S. Reeve. (Abstract from *Bulletin*, U. S. Office of Public Roads.) (96) Jan. 13.
Paving Maintenance Should Include Cost of Cleaning.* (14) Jan. 15.
Monolithic Brick Paving Slabs Show High Bond.* C. C. Wiley. (14) Jan. 15.
A Study of Cushions for Pavements of the Block Type. Maurice B. Greenough. (Paper read before the Am. Assoc. for the Advancement of Science.) (86) Jan. 19.
Pitch Fillers for Block Pavements.* John S. Crandell. (96) Jan. 20.
Proper Oil for Creosoting Wood Blocks for Paving. P. C. Reilly. (18) Jan. 22.
Recent Advancement in the Construction of Brick Pavements. William C. Perkins. (Paper read before the Am. Assoc. for the Advancement of Science.) (86) Jan. 26.
Cost of Surface Oiling of Earth Roads. B. H. Piepmeier. (Abstract from *Bulletin No. 11*, Illinois State Highway Dept.) (86) Jan. 26.
Some Radical Changes in Brick-Pavement Construction.* P. C. McArdle. (13) Jan. 27.
Elevation of Low-Level Streets on Pittsburgh River Front.* Charles M. Reppert. (13) Jan. 27.
Das sanitäre Grün.* Martin Wagner. (39) Serial beginning Sept. 18, 1915.
Raddruck und Felgenbreite. Kayser. (40) Sept. 22, 1915.
Strassenbreiten und Pflasterwirtschaft in kleinen Gemeinden, insbesondere in den weiträumig bebauten Vororten Berlins.* (39) Serial beginning Oct. 5, 1915.
Alt- und Neu-Hamburg.* Martin Mayer. (40) Oct. 20, 1915.
Die Raumkunst im Stadtbau und ihre gesetzlichen Grundlagen.* Martin Wagner. (39) Oct. 20, 1915.

Railroads.

The Electric Locomotive. A. H. Armstrong. (From the *General Electric Review.*) (19) Nov. 27, 1915.
A 5 000 Volt, Direct Current Electric Railway.* Irving B. Smith. (19) Dec. 11, 1915.

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Railroads—(Continued).

Tests of a Mountain Type Locomotive.* (23) Dec. 24, 1915.
Converted Tank Engine, Great Central Railway.* (23) Dec. 31, 1915.
The Jarrow Collision.* (23) Dec. 31, 1915.
The Canadian Pacific Railway System. (23) Dec. 31, 1915.
Electric Traction on the Giovi Line.* (73) Serial beginning Dec. 31, 1915.
The Railway Situation from Different Viewpoints. Julius Kruttschnitt and others. (15) Dec. 31, 1915.
Cars and Locomotives Ordered and Built in 1915. (15) Dec. 31, 1915.
Mileage of American Railroads Block Signaled. (15) Dec. 31, 1915.
The Upkeep of Railway Wagons. (12) Dec. 31, 1915.
Comparative Locomotive Shop Ratios. Henry Gardner. (25) Jan.
The Magnolia Cut-Off on the Baltimore & Ohio Railroad.* (87) Jan.
Steel End Box Cars for the Santa Fe.* (25) Jan.; (15) Jan. 14.
Smoke and Electrification in Chicago. (Abstract of Report of Assoc. of Commerce.) (25) Jan.
The Causes of Shocks in Long Freight Trains. H. C. Pricbe. (Abstract of paper read before the Car Foremen's Assoc.) (25) Jan.
Two Powerful 4-6-2 Locomotives.* (25) Jan.
The Life of a Steel Freight Car. Samuel Lynn. (Abstract of paper read before the Ry. Club of Pittsburgh.) (25) Jan.; (15) Jan. 7; (18) Jan. 15.
Widening of Gauge on Curves. Roger Atkinson. (87) Jan.
Nicholson Tunnel on the Delaware, Lackawanna & Western.* (87) Jan.
Anti-Collision Railway Carriages.* (21) Jan.
Methods and Value of Grade Separation at Crossings.* (87) Jan.
Electrification on the Pennsylvania Railroad.* (87) Jan.
The Chief Cause of Rail Creeping. Joe Rodman. (87) Jan.
Up-Grade Signals on the Delaware, Lackawanna & Western.* (87) Jan.
Formation and Prevention of Pockets and Soft Places. C. A. Davis. (87) Jan.
The Use of Brick for Station Platforms.* Edwin G. Zorn. (18) Jan. 1; (76) Jan. 4.
Considerations in Railway Power Distribution. F. H. Shepard. (17) Jan. 1.
Some Aspects of Heavy Electric Traction. E. H. McHenry. (17) Jan. 1.
Opportunities for Electrification. A. H. Armstrong. (17) Jan. 1.
Tentative Design for Overhead Contact System in the Electrification of Chicago Railway Terminals.* (18) Serial beginning Jan. 1.
Building the Chesapeake & Ohio Northern Railway.* (13) Jan. 6.
Improvements at Pawtucket and Central Falls.* (15) Jan. 7.
The Cleaning of Locomotive Boilers.* E. J. H. South. (Paper read before the Inst. of Locomotive Engrs.) (23) Jan. 7.
Annual Report of the Chief Inspector of Locomotive Boilers. (15) Jan. 7.
Starting Right in Handling L. C. L. Freight Traffic. Wm. L. Burt and others. (15) Jan. 7.
All-Steel Suburban Passenger Cars for the Erie.* (23) Jan. 7.
Some Problems and Principles of Government Regulation of Railroads. Emory R. Johnson. (Paper read before the Pan-American Scientific Congress.) (15) Jan. 7.
The Largest British Built Locomotive.* (22) Jan. 7.
New Alternating Current Signal Installation on the Grand Trunk.* (15) Jan. 7.
No Attempt Yet to Fix Prices in Federal Valuation. (14) Jan. 8.
The Economics of Railway Signalling.* A. G. Shaver. (18) Jan. 8.
Superheaters and Oil Fuel for Indian Locomotives. H. Raynar Wilson. (18) Jan. 8.
Freight Car Rehabilitation, Baltimore & Ohio R. R.* (18) Jan. 8.
The Future of the Steam Locomotive. John E. Muhlfeld. (18) Jan. 8.
Pacific Type Locomotives for the Delaware, Lackawanna & Western R. R.* (18) Jan. 3.
Tunnel Drill Carriages, Their Economic Possibilities.* S. P. Brown. (14) Serial beginning Jan. 8.
The Influence of Modern Engineering on the Future of Railway Economics. Onward Bates. (18) Jan. 8.
Tunnel Lining by Compressed Air Mixing and Placing.* (86) Jan. 12.
First All-Rail Through Route Across New York City.* (13) Jan. 13.
New Pittsburgh North Side Freight Station of the Pennsylvania Railroad.* Hartley M. Phelps. (23) Jan. 14.
Electrification of the Manchester to Bury Section of the Lancashire & Yorkshire Railway.* (23) Serial beginning Jan. 14.
The Lately Revised Standard Code. Harry W. Forman. (15) Jan. 14.
Our Railroads and National Defense. Charles O. Haines. (From the *North American Review.*) (15) Jan. 14.
The Railway Traffic of the Chicago Terminal. (15) Jan. 14.
Sheet Piling a Remedy for Soft Spots in Wet Cuts.* E. L. Sinclair. (14) Jan. 15.
New Freight Terminal of the Lehigh Valley R. R. at Buffalo, N. Y.* (18) Jan. 15.

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Railroads—(Continued).

Conditions on the Railways of Mexico.* (From the *New York Sun.*) **(18)** Jan. 15.
Admits that Market Value will not Reproduce Land. **(14)** Jan. 15.
The Fuel Department (of a Railroad), a Constructive Criticism. L. G. Plant. (Paper read before the New England R. R. Club.) **(18)** Jan. 15.
Woods Suitable for Cross-Ties. R. Van Metre. (Paper read before the Am. Wood Preservers Assoc.) **(96)** Jan. 20.
Possibilities of Steam Railroad Electrification. William Arthur. (Abstract of paper read before the New York Univ.) **(15)** Jan. 21.
Southern Railway High Capacity Dynamometer Cars.* **(15)** Jan. 21.
A Disastrous Collision with an Unusual Cause.* **(15)** Jan. 21.
The Permanent Track Organization on the Long Island. G. P. Williams. **(15)** Jan. 21.
Keeping a Railroad Line Open During Snow Storms. Coleman King and W. G. Dungan. **(15)** Jan. 21.
Some Suggestions for the Improvement of the Railroad Situation. W. J. Moroney. **(15)** Jan. 21.
Railway Construction for New Halifax Ocean Terminals.* **(13)** Jan. 27.
The Commission on Valuation for Rate-Making Purpose. Charles C. James. (From the *Journal of Accountancy.*) **(15)** Jan. 28.
Hand Signals for Crossing Watchmen.* **(15)** Jan. 28.
Reinforced Concrete Train Shed of Unit Construction.* **(15)** Jan. 28.
Belt Conveyors a Success in Pneumatic Tunnel Construction at Boston.* **(14)** Jan. 29.
Protection of Railway Signal Circuits Against Lightning Disturbances. E. K. Shelton. (From the *General Electric Review.*) **(18)** Jan. 29.
Die Neuen Eisernen Bahnsteighallen des Hauptbahnhofes Elberfeld.* **(69)** July, 1915.
Die Neueren Standseilbahnen in Tirol.* George Chr. Mehrtens. **(69)** July, 1915.
Zur Aesthetik der Eisenarchitektur der Berliner Bahnhöfe. Heinrich Pudor. **(69)** Serial beginning Aug., 1915.
Die Erhaltung des Eisenbahngleises unter Verwendung der Asbestonschwelle.* Wambsganss. **(102)** Aug. 1, 1915.
Schaulinien zur Ermittelung des Schienenbiegungs- und Schwellensenkungs-Druckes. R. Neumann. **(102)** Aug. 1, 1915.
Berechnung von zweimittigen Korbbogen.* W. Strippgen. **(102)** Aug. 1, 1915.
Berechnung der Ablaufberge.* E. Weida. **(102)** Aug. 15, 1915.
Zweiachsiger Rettungswagen der österreichischen Staatsbahnen.* G. Garlik Ritter von Osoppo. **(102)** Aug. 15, 1915.
Berechnung der kürzesten Fahrzeiten von Eisenbahnzügen.* E. Rosseck. **(102)** Serial beginning Sept. 1, 1915.
Statische Berechnung von Tunnelmauerwerk, hergestellt in offenem Einschnitt.* Kommerell. **(40)** Serial beginning Sept. 8, 1915.
Berechnung von zweimittigen Korbbogen mit Zwischengerade.* W. Strippgen. **(102)** Sept. 15, 1915.
Einflusslinien zur Berechnung der Eisenbahnschienen.* Loewe. **(102)** Oct. 1, 1915.
Neue Anlage zum Warmauswaschen und zur Gewinnung warmen Wassers in Lokomotivschuppen. v. Glinski. **(102)** Oct. 15, 1915.
"S. R. O."—Achsbüchsen mit Kugellagern von Schmid-Roost in Oerlikon bei der Rhätischen Eisenbahn-Verwaltung.* A. Guhl. **(102)** Oct. 15, 1915.
Der Oberbau der Serbischen Staatseisenbahnen.* G. Klatt. **(102)** Oct. 15, 1915.
Gusseiserne Schienenplatten.* B. Frederking. **(102)** Nov. 1, 1915.
Die Fahrzeuge für die Krankenbeförderung in mehreren Staaten. G. Garlik Ritter von Osoppo. **(102)** Serial beginning Nov. 1, 1915.
Die neue Verordnung betr. Eisenbetonbauten der Aufsicht des Bundes unterstellten Transport-Anstalten, vom 26 November, 1915. Fritz Hübner. **(107)** Serial beginning Jan. 1.

Railroads, Street.

Titanium-Treated Rails in Boston.* **(17)** Jan. 1.
Line Crews Maintain T. H., I. & E. Light Signals.* A. Schlesinger. **(17)** Jan. 1.
New Electric Railway Track Built in 1915. **(17)** Jan. 1.
Electric Rolling Stock Ordered in 1915. **(17)** Jan. 1.
Eliminated Stops in City Service. B. F. Wood, Paul E. Wilson, Elmer E. Strong, and J. V. Sullivan. **(17)** Jan. 1.
One-Man Cars Becoming Popular.* **(17)** Jan. 1.
Concrete Filler for Reinforcing Hollow Steel Poles.* **(27)** Jan. 1.
Fare Collection Revolutionized at Boston.* M. C. Brush. (Paper read before the Am. Elec. Ry. Assoc.) **(17)** Jan. 8.
Estimating Cost of Track Construction on a Unit-Time Basis.* Carl H. Fuller, Assoc. M. Am. Soc. C. E. **(17)** Jan. 8.
Safety First in Seattle.* George Carson. **(17)** Jan. 8.

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Railroads, Street—(Continued).

New Car for Public Service Railway.* H. A. Benedict. (17) Jan. 15.
Fundamental Principles of Car Operation Efficiency.* C. C. Chappelle. (17) Jan. 15.
The Development of the Automatic Car Curtain.* W. H. Forsyth. (17) Jan. 15.
Track Rehabilitation in Springfield, Ohio.* C. G. Keen. (17) Jan. 15.
Snow-Fighting Apparatus. H. Bates. (Abstract of paper read before the meeting of the Connecticut Co. Section.) (17) Jan. 22.
Bay State Substations. (17) Jan. 22.
The Return Feeder System of the Interborough.* I. W. Gross. (17) Jan. 22.
Cars of High Seating Capacity for Hazleton.* (17) Jan. 22.
Load Dispatching at East St. Louis.* Harold W. Clapp. (17) Jan. 22.
Der Bau von Untergrundbahnen in Berlin.* Guntram Mahir. (39) Aug. 5, 1915.
Die Hochbahn in Hamburg.* G. Schimpff. (102) Serial beginning Sept. 1, 1915.

Sanitation.

Mechanical Ventilation.* James Keith. (Paper read before the Inst. of Marine Engrs.) (47) Nov. 26, 1915.
Treatment of Sewage with Electricity and Lime. (60) Dec., 1915.
Sanitary Improvement of a Large Watershed.* George G. Honness. (28) Dec., 1915.
Ozone for Ventilation.* (105) Dec. 15, 1915.
The Character and Extent of Atmospheric Pollution in English and Scotch Towns. John B. C. Kershaw. (105) Dec. 15, 1915.
Domestic Electric Heating and Temperature Control.* (11) Dec. 24, 1915.
Kimberley City Sanitary System. James Dunn. (Report to the Town Council.) (104) Dec. 24, 1915.
The Activated Sludge Experiments at Salford. W. H. Duckworth. (Paper read before the Assoc. of Managers of Sewage Disposal Works.) (12) Dec. 31, 1915; (104) Dec. 24, 1915.
Efficient Plumbing Systems for Small Houses.* (101) Dec. 31, 1915.
Centrifugal Fans for Air Transmission.* Charles L. Hubbard. (101) Dec. 31, 1915.
Disposal of Suspended Matter in Sewage. Rudolph Hering. (Paper read before the Inter. Eng. Congress.) (104) Dec. 31, 1915.
Gasoline-Electric Tractors in New York Street Cleaning Service.* (60) Jan.
The Heat Insulating Properties of Commercial Steam Pipe Coverings.* L. B. McMillan. (55) Jan.
Handling a Peculiar Drainage Situation.* Albert Marple. (87) Jan.
Admission of Liquid Trade Waste Into Public Sewers. Reginald Brown. (114) Jan.
The Activated Sludge Method of Sewage Treatment. Edward Bartow. (60) Jan.
Comparative Rainfall Records Used in Designing Sewers and Drains.* (60) Jan.
The Street Cleaning Problem.* Gus H. Hanna. (Paper read before the Inter. Road Congress.) (60) Jan.; (86) Jan. 5.
Building a Six-Foot Segmental Sewer.* Benjamin Wilk. (76) Jan. 4.
A Notable Application of Electrically Driven Machinery in Sewer Construction at Salt Lake City, Utah.* Bayard W. Mendenhall. (86) Jan. 5.
Eight Years of Imhoff Tank Design and Operation.* Karl Imhoff. (13) Serial beginning Jan. 6.
Sanitary Plumbing Equipment in Factory.* (101) Jan. 7.
Central Station Heating System at Tuskegee.* (101) Jan. 7.
Municipal Swimming Pool Has Unique Features.* (101) Jan. 7.
Furnace Heating System in Rochester House.* Harold L. Alt. (101) Jan. 7.
Mammoth Screw Pumps of New Design Develop High Efficiencies for Low Lifts.* (14) Jan. 8.
Privately Financed Sewer System for Small Town Produces $2 000 Yearly Revenue. Henry W. Taylor. (14) Jan. 8.
What the Wood-Pump Test Means to New Orleans. George G. Earl. (13) Jan. 13.
Testing the 12-Ft. Wood-Nordberg Pump. W. H. P. Creighton. (13) Jan. 13.
Rideau River Intercepting Sewer.* L. McLaren Hunter. (96) Jan. 13.
Modern Wash Houses for Miners.* John A. Garcia. (45) Jan. 15.
Economic Desirability of Expert Operation and Maintenance of Drainage Pumping Plants. G. M. Woodward. (Abstract from *Bulletin 304*, Office of Public Roads and Rural Eng.) (86) Serial beginning Jan. 19.
Method of Keeping a Graphic Cost-Progress Record on Sewer Construction.* W. A. Bennett. (86) Jan. 19.
Data on Straddle Ditch Excavators in Drainage Work. D. L. Yarnell. (Abstract from *Bulletin 300*, Office of Public Roads and Rural Eng.) (86) Serial beginning Jan. 19.

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Sanitation—(Continued).

The Electrically Heated High School at Burley, Idaho.* F. E. Ware. (27) Jan. 22.
Gas Fired Steam Radiators for Heating Apartment Houses, a Successful Installation.* H. Thurston Owens. (24) Jan. 24.
British and American Patents on Activated Sludge. (13) Jan. 27.
Main Garrison Creek Storm Overflow Sewer and Extensions, Toronto. R. T. G. Jack. (96) Jan. 27.
Hydraulic Ejectors for Grit Removal Merit Trial in Sewer Maintenance.* John H. Gregory. (14) Jan. 29.
Installation de Filtration d'Eau à la Piscine Municipale Ledru-Rollin à Paris.* J. De Just. (33) Jan. 8.
Grundsätze für die Bauweise und Kühling hocherhitzer Betriebsräume. H. Chr. Nussbaum. (7) July 24, 1915.
Die Kläranlage des Liller Schlachthofs.* P. Keim. (7) July 31, 1915.
Die Prüfanstalt für Heiz- und Lüftungsanlagen an der Technischen Hochschule in Berlin-Charlottenburg.* Uber. (40) Aug. 4, 1915.
Betrachtungen über die elektrische Raumheizung im Wissenschaftlich-Photographischen Institut der Kgl. Sächs. Technischen Hochschule zu Dresden.* H. Frank. (7) Serial beginning Aug. 7, 1915.
Zur Berechnung der Grösse von Sammelbehältern selbsttätiger Pumpanlagen.* Schieckel. (7) Aug. 14, 1915.
Ueber Lüftungsleitungen an Abwasserleitungen und über Geruchverschlüsse.* Otto Spiegelberg. (7) Aug. 28, 1915.
Geschmacksgrenze für die Beimischung von Kaliendlangen zu Trinkwasser. W. P. Dunbar. (7) Aug. 28, 1915.
Die Prüfanstalt für Heiz- und Lüftungsanlagen in Charlottenburg.* R. Uber. (7) Sept. 4, 1915.
Ueber Lüftung von Aborten und sonstigen Bedürfnisräumen.* Otto Spiegelberg. (7) Sept. 18, 1915.
Ueber die Wirkung von Chlormagnesium enthaltender Endlange von Chlorkaliumfabriken auf die Ernteerträge. Haselhoff. (7) Sept. 18, 1915.
Elektrische Fernstell- und Rückmeldevorrichtung für Lüftungs- und Heizungsanlagen.* F. A. Buchholz. (7) Sept. 25, 1915.
Die Heizungs- und Maschinenanlagen des städtischen Krankenhauses in Pforzheim.* R. Garz. (7) Sept. 25, 1915.
Vorläufige Betriebsergebnisse der Lüftung im Hörsaal der Prüfanstalt für Heiz- und Lüftungs-anlagen. K. Brabbee. (7) Sept. 25, 1915.
Betrachtungen über Druckrohrleitungen städtischer Entwässerungsanlagen.* Johannes von Hanffstengel. (7) Serial beginning Oct. 2, 1915.
Elektrische Heizung.* Siegfried Baumann. (7) Oct. 2, 1915.
Ein Prozess wegen Vorfluterverunreinigung durch eine städtische Kläranlage. P. Rohland. (39) Oct. 20, 1915.
Abfallverwertung in der Tonindustrie. Max Roesler. (80) Oct. 21, 1915.
Die Magnetische Hand.* G. Klingenberg. (41) Dec. 16, 1915; (48) Dec. 15, 1915.

Structural.

The William Hall Walker Gymnasium.* (8) Oct., 1915.
Paint and Dye Testing. Wm. Roy Mott. (Paper read before the Am. Electrochemical Soc.) (19) Nov. 27, 1915.
Improving Concrete by the Use of Hydrated Lime. (60) Dec., 1915.
Fire Prevention. Charles E. Meek. (Paper read before the Pennsylvania Industrial and Public Welfare and Eng. Conference.) (98) Dec., 1915.
The Relative Corrodibilities of Iron and Steel. J. Newton Friend. (Paper read before the Faraday Soc.) (47) Dec. 17, 1915.
Results of Some Tests to Determine the Load Distributions Through Reinforced Concrete Slabs.* (86) Dec. 29, 1915.
Humidity-Control Process for the Drying of Lumber.* W. H. Lewis. (23) Dec. 31, 1915.
Discussion of Some Special Methods of Reinforced Concrete Design. J. R. Worcester, H. B. Andrews and M. J. Lorente. (109) Jan.
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Graphical Treatment of Elastic Ribs.* C. S. Whitney. (36) Jan.
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Rigid Tests for Fire Brick and Fire Clay.* J. F. Mowat. (76) Jan. 4.
Design of a Million-Bushel Public Grain Elevator at New Orleans, La.* (86) Jan. 5.
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Cleaning Hollow Piles with a 10-In. Orangepeel.* G. L. Knight. (13) Jan. 6.

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Reinforced Concrete Combined with Timber for Coal Pockets and Trestle.* Charles F. Dingman. (14) Jan. 8.
High and Low Sulphur in Basic Steel.* J. S. Unger. (Paper read before the Soc. of Automobile Engrs.) (20) Jan. 13.
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Ancient Lights. A. E. Porte. (Paper read before the Eng. and Scientific Assoc. of Ireland.) (104) Jan. 14.
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Tables Facilitate Accuracy in Timber Beam Design. R. C. Hardman. (14) Jan. 29.
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La Thermo-Electricité des Aciers Spéciaux.* Eugène L. Dupuy et Albert M. Portevin. (93) Aug., 1915.
Die Rammwirkung im Erdreich, Versuche auf neuer Grundlage.* Karl Zimmermann. (79) Vol. 25.
Durchlaufende Träger auf 4, 5 and 6 Stützen unter verteilten und Einzellasten. H. Nitzsche. (51) Sup. No. 24, 1915.
Neue Anwendungen des Gussbeton-Verfahrens.* Rank. (51) Sup. No. 24, 1915.
Graphische Bestimmung der Abstände der Horizontalriegel in Bunkern.* Ludw. Billeb. (69) July, 1915.
Zur Frage der Verwendung Vereinfachter Elastizitätsgleichungen bei der Berechnung Mehrfach Statisch Unbestimmter Systeme.* Pirlet. (69) July, 1915.
Beitrag zur Montage Grosser Hallen.* Hans Badstein. (69) Aug., 1915.
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Bemessung von Saulenankern und Säulenfussplatten.* Spangenberg. (40) Aug. 4, 1915.
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Gegen das Verallgemeinern. (80) Aug. 31, 1915.
Ueber Mittelbaren und Unmittelbaren Rostschutz mit Besonderer Berücksichtigung der Rostverhütenden Anstriche nach Dr. Liebreich. Leopold Herzka. (69) Sept., 1915.
Beitrag zur Standfestigkeitsberechnung der Führungszerüste von Gasbehältern.* Wendt. (69) Sept., 1915.
Versuch zur Beseitigung der Wasserdurchlässigkeit von Beton bei einer Brückenfahrbahn. Hartmann. (40) Sept. 1, 1915.
Mörtel von der römischen Jagdvilla Otrang. (80) Sept. 4, 1915.
Neuerungen im Schornsteinbau und neue Ausführung von Lüftungskanälen. E. Correll. (7) Sept. 4, 1915.
Das Rosten der Eiseneinlagen im Beton. W. Roeder. (80) Sept. 11, 1915.
Bewertung von Kies und Sand. (80) Sept. 16, 1915.

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Neubau der "Parkschule" (Gymnasium) in Berlin-Tempelhof.* Fritz Bräuning. (40) Sept. 22, 1915.
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Beitrag zur Berechnung der Knicksicherheit von Stäben mit Veränderlichem Querschnitt. Karl Hoening. (69) Oct., 1915.
Rammversuche mit eisernen Spundpfählen in Fürstenberg a. d. Oder.* R. Scheck. (40) Oct. 2, 1915.
Einfluss des Trocknens auf die Festigkeit von Schlackensteinen. H. Burchartz. (80) Oct. 2, 1915.
Schwindung von Portlandzementen und Eisenportlandzementen. A. Guttmann. (80) Oct. 7, 1915.
Lufttrockenschuppen.* G. Fleschhut. (80) Oct. 7, 1915.
Die Wirksamkeit des Eisenoxyds bei der Bildung des Portlandzementklinkers. Edward D. Campbell. (80) Serial beginning Oct. 7, 1915.
Unzulänglichkeit der Mittelwerte bei Druckfestigkeitszahlen. (80) Oct. 14, 1915.
Holzkonservierung. Rudolf Müller. (39) Oct. 20, 1915.
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Zur Berechnung der in Berlin für hintere Gebäude zulässigen Höhe.* Clouth. (51) Dec. 18, 1915.
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Topographical.

Topographical Survey, Fort Sill Military Reservation.* D. H. Connolly. (100) Jan.
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New Topographic Survey Methods for Rapid Work.* James H. Bonner and Frank E. Bonner. (13) Jan. 6.

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Pump Slip Tests as an Aid to Efficiency in the Operation of Pumping Engines. H. T. Havill. (28) Dec., 1915.
Electrically Operated Valve Installations and Their Control from a Distance. Alfred Williamson. (28) Dec., 1915.
Kensico Reservoir.* Wilson Fitch Smith. (28) Dec., 1915.
The Brooklyn Water Supply. William F. Laase. (28) Dec., 1915.
Testing Meters with Reference to Curves of Accuracy and Friction Loss.* Fred B. Nelson. (28) Dec., 1915.
Control of Public Water Supplies by the Conservation Commission of the State of New York. Russell Suter. (28) Dec., 1915.
Laying Water Pipes in Congested Streets, New York City.* M. Blatt. (28) Dec., 1915.
The Present Status of the Catskill Water Supply for New York City.* J. Waldo Smith. (28) Dec., 1915.
Leadite for Joints in Cast-Iron Water Pipe. W. C. Hawley. (28) Dec., 1915.
Leadite Joints for Water Pipes. Henry A. Symonds. (28) Dec., 1915.
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Definition of Term Domestic Purposes in General and Private Water Acts. A. B. E. Blackburn and Percy Griffith. (Paper read before the Institution of Water Engrs.) (66) Dec. 21, 1915; (104) Dec. 17, 1915.
Water Supply Systems for Country Homes. Joseph E. Taggart. (101) Dec. 24, 1915.
Notes on the Duty of Water.* J. W. Beardsley. (36) Jan.
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Water Hammer. William Ransom. (114) Jan.

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British Columbia Hydroelectric Developments.* G. R. G. Conway. (Report to the Water Power Branch of Canada.) (111) Serial beginning Jan. 1.
Report on Columbia River Power Project. Edward A. Beals and L. F. Harza. (111) Serial beginning Jan. 1.
Building a Big Earth Dam.* (19) Jan. 1.
Tacoma Hydro-Electric Power Plant.* W. L. Kidston. (64) Jan. 4.
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Variation in Annual Rainfall.* Allen Hazen. (13) Jan. 6.
Recent Progress and Tendencies in Municipal Water Supply. John W. Alvord. (Paper read before the Inter. Eng. Congress.) (96) Serial beginning Jan. 6.
Tanks for Temporary Storage of Storm Water.* W. G. Cameron. (96) Jan. 6.
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A Discussion of 14 Important Features of Water Works Operation, Montana Regulations Governing Water Service. (86) Jan. 12.
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Testing Water-Works Mains at Hartford, Conn. Caleb Mills Saville. (13) Jan. 13.
Steel Pipe Lasted 22 Years.* E. G. Markley. (13) Jan. 13.
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Five Schemes Considered for Power Development at Kananaskis Falls, Alberta.* Harold S. Johnston. (14) Serial beginning Jan. 15.
Status of Water-Power Development.* H. W. Buck. (Paper read before the Pan-American Scientific Congress.) (27) Jan. 15.
Analysis of the Failure of an Earth-Fill Dam. Guy Sterling. (13) Jan. 16.
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Quebec Air-Lift Pump Raises Water 495 Feet. (13) Jan. 20.
Reservoir and Concrete Dam in Glacial Drift.* H. J. Langlois. (13) Jan. 20.
The Lewiston-Waha Power Syphon.* Otto B. Goldman. (111) Jan. 22.
Tar Coating Protects High Velocity Conduits, Arrowrock Dam Outlets of Concrete, Discharging at 60 Ft. per Second, are Painted with Water-Gas Tar and Coal Tar. Charles H. Paul. (Abstract from *Reclamation Record.*) (14) Jan. 22; (86) Jan. 19.
Santa Barbara has Subterranean Storage Reservoir.* (14) Jan. 22.
Water Powers of Canada.* (19) Jan. 22.
Engineering and Economic Features of the Irrigation System of the Los Angeles Aqueduct, Construction Just Beginning.* Burt A. Heinly. (86) Jan. 26.
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Solving the Imperial Valley Irrigation Problems. (13) Jan. 27.
Water for Fires at Hartford. Caleb Mills Saville. (13) Jan. 27.
Old and New Water Tanks at Princeton, N. J.* R. W. Becker. (13) Jan. 27.
Masonry Dams. Arthur P. Davis and D. C. Henny. (Abstract from paper read before the Inter. Eng. Congress.) (96) Jan. 27.
Swiss Automatic Gates will Guard Wissota Dam. (14) Jan. 29.
Berechnung von Warmwasserbereitungsanlagen für Wohnhäuser. Ernst Kohlke. (7) July 17, 1915.
Geschmacksgrenze für die Beimischung von Kaliendlaugen zu Trinkwasser. W. P. Dunbar. (7) Aug. 28, 1915.
Die Wasserversorgung von New York.* (40) Serial beginning Aug. 28, 1915.
Die Beeinflussung von Grundwasserwerken durch Hochwasser. Kruse. (112) Sept. 1, 1915.
Zur Berechnung der Warmwasser-Versorgungsanlagen.* Alex. Marx. (7) Sept. 11, 1915.
Die geschichtliche Entwicklung der Stralsunder Wasserversorgung. Rauschenbach. (112) Serial beginning Sept. 16, 1915.
Die hydrologischen Verhältnisse Mecklenburgs. E. Geinitz. (112) Serial beginning Oct. 1, 1915.
Die Wasserversorgung von San Francisco während des Erdbebens.* Herzner. (112) Oct. 1, 1915.
Fluss- und Brunnentemperaturen beim Wasserwerk der Stadt Florenz. (112) Oct. 16, 1915.
Unterirdische Wasserscheiden.* E. Prinz. (112) Serial beginning Oct. 16, 1915.
Die Wasserkräfte der Schweiz. H. Keller. (40) Serial beginning Oct. 30, 1915.

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Der Einfluss der Kaliabwasser auf die Lederfabrikation. W. P. Dunbar. (7) Serial beginning Oct. 30, 1915.
Landeswasserversorgung in den Niederlanden.* Herzner. (112) Nov. 1, 1915.
Beitrag zur Beeinflussung von Grundwasserwerken durch Hochwasser.* A. Lang. (112) Nov. 1, 1915.

Waterways.

Depositing Material by Derrick Beyond Reach of Boom.* M. A. Milliff. (100) Nov., 1915.
A Compilation of Experiences and Conclusions of Eminent Authorities as to the Utility of Outlets in Reducing the Height of Floods, Citing all Opinions Found, Whether for or Against.* J. A. Ockerson. (100) Nov., 1915.
Quartermaster and Submarine Mine Wharf at Key West, Fla.* J. R. Slattery. (100) Nov., 1915.
Flooring the Sea with Concrete.* W. J. L. Kiehl. (46) Nov. 27, 1915.
Improvement of Quequechan River in Fall River, Mass.* (60) Dec., 1915.
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Failure of Masonry and Rock Ledge Cofferdam at Louisville and Portland Canal.* J. C. Oakes, M. Am. Soc. C. E. (100) Jan.
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Coal Dock for the Southern at Charleston, S. C.* (15) Jan. 14.
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Grouting Under Canal Lock Wall Foundation.* Eric P. Muntz. (96) Jan. 20.
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Le Canal de Panama.* A. Dumas. (33) Dec. 25, 1915.
Verbauung von Flusskrümmungen.* Hermann Sommer. (40) Sept. 4, 1915.
Bau einer neuen Seeschleuse in Ymuiden und Vertiefung des Nordseekanals nach Amsterdam. A. von Horn. (40) Sept. 4, 1915.
Die Ueberwölbung eines Ueberfallgrabens bei Gleiwitz.* Hache. (39) Sept. 5, 1915.
Uferschutzbauten am Strande von Marina di Pisa gegen die Korrosionswirkungen des Meeres. K. Haller. (39) Sept. 18, 1915.
Abfluss- und Versickerungsmengen der Oder.* Karl Fischer. (40) Sept. 25, 1915.
Abflussmessungen mit Salzlösung; Vergleich mit Ueberfall-, Schirm- und Flügelmessungen. H. Keller. (40) Oct. 13, 1915.
Drahtwalzen bei der Rheinreglung Sondernheim-Strassburg.* Th. Krauth. (40) Oct. 16, 1915.
Abflussverhältnisse der Gletscherbäche. H. Keller. (40) Oct. 23, 1915.
Untersuchungen über das Verhalten von Mörtel- und Betonmischungen mit Trasszusatz beim Bau der neuen Seeschleuse in Emden.* Zander. (40) Nov. 3, 1915.
Ein neues Verfahren von Uferschutz- und Leitwerken.* Leopold Arndt. (53) Dec. 17, 1915.

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